Reflective Display Technology

In our hyper-connected digital age, one of the challenges confronting digital displays is how to introduce paper- and ink-like high contrast ratio and readability in bright sunlight for outdoors. How can we turn this challenge into an advantage?

Reflective displays offer the solution with easy to read screens that work well both outdoors and indoors. Furthermore, the low power consumption makes them an even more attractive commercial signage proposition. According to market research conducted by IDTechX, public information display will become the biggest application of reflective displays, so let’s dive into understanding why reflective displays will be so important for digital signage.

Despite the benefits of high contrast ratio and best-in-class power efficiency, reflective display technology has seen slow adoption. The most significant hurdles have been related to difficulties with color implementation and video playback. Frequently, e-paper screens render color in washed-out tones, rather than the crisp and vibrant hues often required from digital displays.

However, the potential of reflective displays is tremendous, particularly because of their sustainability and ability to deliver resilient disaster communications. This is why some of the leading manufacturers and scientists are working on perfecting them for large scale public signage use.

How reflective displays work

**Standard Transmissive LCD displays** rely on a backlight as the light source to illuminate the display. This means that the displays work well in low light but in direct sunshine they perform poorly. To cope with brighter lighting conditions, the screens need to provide higher contrasts. In order to achieve this, manufacturers use brighter backlights, which increase display power consumption and driving up the cost of running a digital signage installation.

In comparison, reflective displays can be run using an external light source to illuminate the display, reflecting it back to the user via a reflector at the back of the screen. This means they do not rely on the backlight and reduce the glare from displays and the power needed to run them.

Transflective displays combine the features of both transmissive and reflective screens by using a semi-reflective strip and a backlight, making it suitable for use in almost all conditions.

Transmissive vs reflective vs transflective displays

The choice between transmissive, reflective or transflective displays depends on the requirements of your installation.

- Transmissive displays are best if you are looking for bright colors and low-cost under low-ambient light use.
• Reflective displays are recommended for outdoor installations with direct sunlight use to provide a wide viewing angle, low power consumption, slim design, and low glare for eye comfort.
• Transflective displays are the solution for the requirements of the best image quality and quick video playing in an environment with mixed low and bright ambient light use.

Global market outlook for reflective displays

Currently, e-readers and mobile devices have almost three quarters of the reflective display market share.

According to a research by Technavio, the global market share for reflective public information displays will reach 0.78 billion by 2020.

Global EPD market for public displays

Source: Technavio, 2015
Reflective displays have several selling points propelling this expected growth:

- Variety of use cases: reflective displays are already utilized in public transit systems for emergency communications and as the technology develops they will become suitable for a wider range of public information display applications.
- Lightweight, durable screens: which makes screens less fragile and easier to transport and install.
- Energy efficiency: cheaper and more sustainable to run, which can help organizations hit sustainability targets and protect them against the effects of volatile energy prices.
- Improved color: as reflective screens evolve to rival LCD screens’ color resolution, reflective digital signage will be capable of displaying eye-catching videos and images.
- Quicker refresh rates: this will enable high-speed, high-quality applications required by digital signage professionals.
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Public Information Display

Reflective vs. Transmissive Display

- **Outdoor Visibility**: Reflective displays excel in outdoor environments due to their ability to create glare without the need for backlighting, making them highly visible. On the other hand, transmissive displays require backlight, making them less visible in bright sunlight.

- **Eye Comfort**: Reflective displays reflect light, which can be uncomfortable for the eyes, especially in bright conditions. Transmissive displays, by contrast, emit light from the display face, which is less intrusive on the viewer's eye comfort.

- **Best Image Quality (Indoor)**: Reflective displays do not excel in indoor settings due to the glare effect, whereas transmissive displays are optimized for indoor use, ensuring high image quality without the interference of ambient light.
Case study: reflective displays to aid emergency communications in Japan

During a natural disaster disseminating accurate information and reaching those stranded outside their homes is a top priority. When weather-related disasters occur, the power needed by LCD signage can drain vital grid reserves, whereas reflective displays’ energy efficiencies make them ideal for disaster communications networks.

Application of reflective displays is currently being tested in Japan, where vulnerabilities to earthquakes, typhoons, and other extreme weather events necessitate a robust emergency communications system. In 2009 a small trial using e-paper took place in Tokyo using wireless technology to send and receive information from a disaster-stricken area.

(Image source: Nikkei Technology)

Building up to the 2020 Olympics, city officials are creating a program to make Tokyo the world’s safest city and reflective digital signage is expected to play a major role in this strategy. Once a robust information infrastructure has been built, reflective screens will be used to prevent panic erupting from misinformation, keeping residents and visitors fully informed even when the power grid fails.

Displays will use Geographic Information Systems to provide multi-lingual communications on the signage. In areas where there are a lot of foreigners are expected, smart signage installations will provide WiFi as well.

If the power grid is completely disconnected by the disaster, reflective display units could be powered by local batteries.
What's next for large format displays?

While most advancements in reflective display technology to date have been on a smaller scale, Samsung Display recognizes the possibilities of reflective display technology and is spurring development in this area, with the plan of rapidly changing the market.

Samsung Display’s R&D teams are working towards technical innovations that will allow for vivid color and crisp video playback on reflective displays. SDC’s line-up of reflective displays will be optimized to perform in bright sunlight and provide wide viewing angles while also delivering on the promise of energy efficiency.

Keep an eye out for these revolutionary new display technologies in your city!

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