

SPIE Professional October 2009

Display Markets Flex Up

Improvements in brightness and energy efficiency for displays may drive consumer costs down and manufacturers' revenues up.

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Several breakthroughs have been made in display technology in the past couple of decades, from CRT (cathode ray tube) to more advanced displays such as LCD, plasma, touch-screen, and now the flexible display screen (with Organic LED).

Leading companies in the field, such as Samsung, Philips, Sharp, Sony, Toshiba, and LG, are employing display technology for TVs, desktop computers, laptops, mobile phones, and other electronic imaging devices.

The breakthrough innovations are affecting the brightness of the displays, the price, and energy efficiency, and the market is responding.



A flexible display mockup. (Photo courtesy of ASU and Philip Spears.)

Market Overview

- The total global next-generation display market is expected to be worth US\$16.9 billion by 2014, out of which 42% of total revenues will be accounted for by the Asian market.
- A Chinese government subsidy program for consumers trading up from CRT to LCD home appliances in urban areas has resulted in an increase

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to the 2009 LCD TV forecast for China, from 18.8 million units to 23.6 million units.

- DisplaySearch expects LCD TV sales to increase to 127 million units this year, an increase of 7 million units from 2008.
- LCD TV brands such as Samsung, Philips, Sharp, Sony, Toshiba, Vizio, and LG are planning to increase LED backlights for TV screens because of reduced cost compared to the CCFL (cold cathode fluorescent lamp) structure.
- LED backlights in desktop computer monitors are expected to reach 31 million units in 2012, according to DisplaySearch.
- The DisplaySearch market analysis on touch panels forecasts the total touch-screen market growing to \$9 billion by 2015, from \$3.6 billion in 2008, with a compound annual growth rate of 14% by 2015.
- Mobile phones are the biggest application of touch screens in terms of unit shipments; DisplaySearch forecasts the penetration rate of touch-screens in mobile phones will reach nearly 40% by 2015.
- The capacitive touch-screen and touch-button controller segment is projected to hit 1.3 billion units by 2012, a 44% compounded annual growth rate, according to Gartner Inc.
- New technology in display screens with OLED is a hot topic for producing flexible displays made from polymers. Sony and Samsung SDI have developed the world's thinnest active-matrix OLED screen for flexible display. According to iSuppli, the OLED market for flexible displays will be worth \$2.9 billion in 2011.

Trends

Sales of mobile phones, especially those with touch-screen displays, are driving the growth in the market.

Touch-screen displays with capacitive technology provide more brightness, and external elements such as dust or water do not affect them.

Whether using touch-screen or resistive-touch technology, mobile phones and their multi-functional displays for GPS, video conferencing and movies, better picture resolution, and user-friendly technology have become the key driving factors for cell phone consumers.

Another trend is in the production of more energy-efficient displays incorporating green technology. With more public awareness towards environmentally friendly products, brands such as Apple, Sony, Samsung, and Philips are improving display efficiency with TFT-LCD and PC/TV technology. Recognizing that plasma and LCD screens consume more power, manufacturers are also making advances with OLED displays which consume less power and offer flexibility.

Advances in display technology will continue to provide better options for imaging solutions in the future. Due to the low power consumption and wide applications, the next generation 2-D, one-sided display is expected to have the largest market segment, with Asia dominating because of its low labor and manufacturing costs.

Consumers will go for thin screen displays that are lightweight, reliable, provide more brightness, and are energy efficient and cost effective.

Advances in Flexible Displays at Arizona State University

[Arizona State University's Flexible Display Center](#) (FDC) announced in June the first a-Si:H active matrix flexible OLED display to be manufactured directly on DuPont Teijin's polyethylene naphthalate (PEN) substrate.

The flexible display uses Universal Display Corp.'s phosphorescent organic light-emitting diode (PHOLED) technology and materials and the FDC's proprietary, low-temperature process and bond-debond manufacturing technology.

The U.S. Army, which is funding research at the center, is one of many possible users for a flexible screen that will bend and potentially roll up for easy transport. The 4.1-inch monochrome quarter video graphics array (QVGA) also has potential as a wearable computer application.

In February, the FDC, with partners E Ink Corp. and DuPont Teijin Films, demonstrated the world's first touchscreen active matrix display on a flexible, glass-free substrate.



View the [preview](#) of the SPIE Lithography Asia in Taiwan for more information about lithography and the display industry.

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DOI: 10.1117/2.4200910.07

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