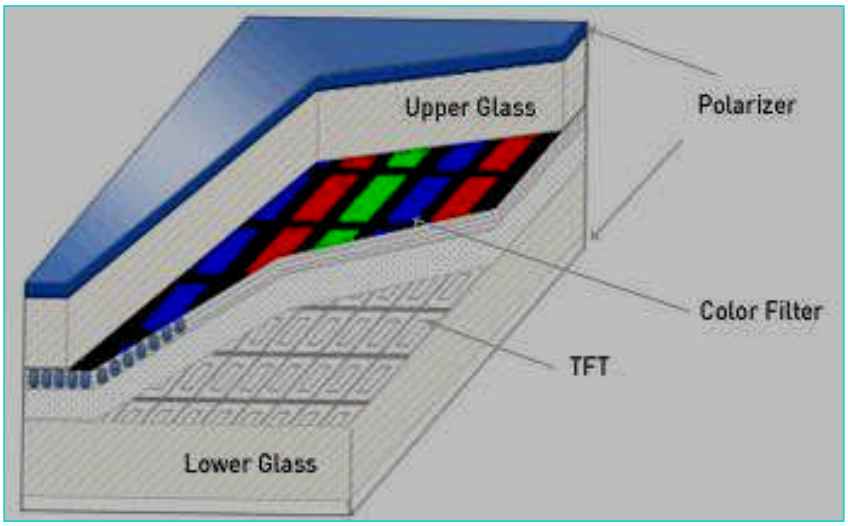
FLAT PANEL DISPLAYS - PHOTONICS NEWSLETTER

June 2007 - Ken Gilleo - www.Trends.com

MARKET & BUSINESS INFORMATION



FPD Market Growth - The global electronic display market is expected to exceed $100-billion in 2007 - a major milestone for the industry according to iSuppli. TFT-LCD (Thin Film Transistors-Liquid Crystal Display) is the dominant technology in the market and it's rising faster than the display industry as a whole; about 73% share and surpassing $70-billion in 2006. TFT-LCD production will reach nearly 2.5-billion units in 2011, up from 1.2 billion in 2006. LCDs will account for 65% of all TV displays in 2011, up from 11% in 2005. The total display market, including FPD, projection and CRT products, will reach $104.3-billion in revenue in 2007, up 8%. The biggest opportunity for TFT-LCD revenue growth outside of the television market is in professional displays, including signage and conference room projectors. LCDs are taking share away from plasma in indoor-venue signs and retail signage. Professional display revenue will reach $14.6-billion in 2011, up from $10-billion in 2007. Sources: Electronic Design, iSuppli. ***[The increasing FPD market means more materials sales of the dozens of ingredients that go into these displays that include; anisotropic conductive adhesives, bonding/laminating adhesives, brightness enhancement films, clear plastic films, color filters, diffuser films, dyes, encapsulants, flexible circuits, glass, indium tin oxide targets, light guides, liquid crystal chemicals, polarizers, sealants, photoresists, spacers, reflector films, solder masks, TAB tape, and viewing angle control film.]***

Interactive PoP Displays - Pelikon Ltd. (Wales), a developer of printed inorganic (PE) electro-luminescent displays, announced an investment of an additional $6-million in R&D. Established in 2000, Pelikon has invested about $34-million in its U.K. manufacturing and R&D of touch screen displays and backlights. Pelikon's printed segmented electro-luminescent (pSEL) hybrid display technology is set to revolutionize the touch display applications, particularly in mobile phones, according to their managing director. The Pelikon hybrid display is highly visible under any lighting conditions, but also allows manufacturers to offer an intelligent keypad that changes according to the functions. Pelikon is a spinout from Cambridge Consultants Ltd. that develops and makes inorganic electroluminescent displays including flexible, plastic versions. The company has signed an integrator partnership with Memtron Input Components, the membrane switch division of Esterline (USA).

Touch Screen Display for Shopping - Ralph Lauren launched a 24-hour interactive window giving customers the opportunity to shop by touching a wide screen monitor outside the company's flagship London store. They recently demonstrated the "window shopping" screen, which guides shoppers through the brand's Wimbledon line and shows video tennis clips. Models in Ralph Lauren outfits are projected onto a 78-inch lightweight touch foil screen applied directly to the glass.

TECHNOLOGY

OLED Future? - We've been tracking the OLED industry for some time and the future is unclear. The technology, based on organic materials and Printed Electronics (PE), has a large potential, but manufacturing issues that affect cost and scalability seem to be limiting the technology right now. Here's what iSuppli has to say. Worldwide shipments of TVs using OLED displays will increase at a CAGR of 170.6% and reach around 1.2-million units in 2012, but at a value of $690.6-million. ***Note that this is a conservative estimate that assumes the manufacturing problems won't be solved.*** But they go on to predict that manufactured will involve applying polymer LEDs (PLEDs) onto substrate using inkjet printing. Today, most OLED TVs use vacuum deposition processing technology. But in the final analysis, iSuppli only forecasts worldwide OLED TV shipments at below 0.5% share for 2011. **I'm still counting on some breakthroughs in Printed Electronics and Polymer LED, but time will tell. Inevitably, it comes down to cost-effectiveness.**

Bi-Stable Displays - The bi-stable displays have the capability to hold images with zero-power consumption and that opens new markets while allowing entry into all of those that now exists. The technologies are finally in place and proven so that a real market is beginning to consolidate. Shipments for bi-stable displays, a set of technologies that spans LCDs, electrophoretic, and electrochromic, and others, are expected to increase by about 1200% 2007 to 2012 per iSuppli. They are well suited for flash-memory storage devices, smart cards and e-book applications. But expect competition between bi-stable and low-power LCD displays as both vie for the Electronic-Shelf-Label (ESL), Point-of-Purchase (POP) and mobile-phone markets that are growing rapidly in terms of digital display adoption. Limiting power consumption of their portable devices and always-on signage to extend their battery life is a big plus. The 2007 estimate is $77.9-million. Global shipments of bi-stable displays are expected to reach 350-million units by 2012; CAGR of 65% in 2007. Market revenue is forecast to reach $516-million by 2012. The total market for low-power LCD and OLED displays is also expected to grow rapidly, reaching $24-billion by 2012; CAGR of 27% from $6-billion in 2007. Low-power LCD types include reflective, low-power transmissive and low-power transflective. Such low power transmissive and transflective LCDs are defined according to their power consumption for certain screen sizes, brightness and performance. Memory read-out is one new market for bi-stable displays (see photo at right). ***[I give a high rating for the potential of bi-stable displays since they uniquely solve problems like stand-by power and daylight readability].***

Low/No Power and Color - Low-power LCDs will continue to dominate the notebook PC market, ultra-mobile PCs, Portable Media Players and most other mobile devices since full color and fast response time is required. ***Bi-stable displays have yet to achieve color on a commercial scale, but I***

think that there are viable ways of getting to color. But for the moment, bistable displays are typically black and white. There are a number of different approaches to achieve bistable displays. E Ink has worked with Royal Philips Electronics to develop a bistable display based on electrostatic charges used to affect tiny spheres suspended in a plane (see diagram). The spheres are electrostatically charged with a black half carrying the negative charge and a white half carrying the positive charge. Two electrodes surround the plane; the front one transparent. When a charge is placed across the electrodes, the spheres rotate to align with the front-to-back charge gradient. Because the spheres are suspended in a semi-solid when the power is removed, they remain in that position and the display continues to show whatever design or text it showed before power was removed.

Kodak and Microsup electronic paper uses a liquid crystal dispersed in a polymer while the SiPix process uses a microcup structure to hold electronic ink stable. NTERA uses a NanoChromics technology where nanostructured semiconducting metal oxide films that have a layer of viologen molecules creates black and white high contrast images. ZBD has created the Zenithal bistable display which uses a simple micro-structured grating surface as a way to control liquid crystal alignment. At present, black and white are the only two stable orientations for the molecules in the display. BiNem is an acronym that comes from Bistable Nematic, a development of Nemoptic. This combination has produced a black and white display. Nemoptic has also announced a 32,000-color bistable LCD using a grayscale device and LCD color filters. Working with Panasonic, Kent Displays has shown an e-book reader with VGA monochrome bistable cholesteric LCD technology. A prototype color cholesteric LCD is under development. Source: general web searching.

DISPLAY MANUFACTURING & EQUIPMENT

Touch Screens are Everywhere - While touch screens are a very mature technology, new products, especially the iPhone, are adding a big boost. Taiwan will make most of them; Hon Hai Group, Compal Electronics, Uni-President Group, Chi Mei Group, and CMC Magnetics are capable manufactures. The Technology Research Institute (TRI - Taiwan) estimates the global market for iPhones alone will amount to $2.69-billion for 2007. The trend is expected to continue and shipments of touch panels are predicted to be 95-million units in 2010. The most common approach is film-on-glass and capacitive touch technologies with patents held by American and Japanese manufacturers; some patents are about to expire. Taiwanese firms have focused on capacitive touch panels and some have their own patented technologies. A capacitive touch panel traditionally has three major components: a touch panel, a touch controller, and a utility. The panels are classified into four types by functional principles, including resistive, capacitive, surface acoustic wave, and optical. Most manufacturers prefer to turn out capacitive touch panels, because they are relatively hard to scratch and break. Most use ITO conductors on glass. Four other leading local manufacturers of ITO conductive glass-Wintek, Applied Vacuum Coating Technologies, GemTech Optoelectronics, and RITEK-are concentrating on the production of advanced ITO capacitive touch panels. Source: CENS

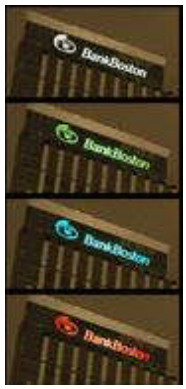
PROJECTORS

Sanyo's Ultra-short Focus Projector - Sanyo Electric launched a new projection technology that allows projection in a number of positions and on a number of untraditional surfaces, with the technology used on the new LP-XL50 ultra-short focus projector. Sanyo claims the new ultra-short focus LCD front projector features the world's shortest projection distance. The new LCD projector will be on sale in Japan at the end of a 2007. The new projector is ideal for the use at pre-school, classroom settings, strategy meetings, department store and for business presentations. Last year, Sanyo launched the LP-XL40 projector fitted with an ultra-short focus lens capable of projecting images of 80 inches from a distance of about 4 ft. Sanyo has developed a new optical engine that can project an 80 inch image from only 3-inches away. Source: DigiTimes.

3D Displays

There's a lot of action in the 3D display area lately, but few have adopted holography. Germany's SeeReal uses the latest holographic techniques for their 3D viewing prototype. The company reportedly developed a new technology for displaying 3D images on a TV set, computer display, or through a projector. The method uses proprietary Tracked Viewing Window technology to reduce pixel size to HDTV levels and combine with a real-time tracking system that eliminates superfluous elements while reducing the need for real-time processing. The firm's main objective was to remove the inconvenience factor that's typically associated with viewing 3D imagery, and with its unique use of holography, it has reportedly done so. The company is still looking for partners in the commercial world.

LARGE DISPLAYS



Color-Changing 18 ft. x 92 ft. Display - Bank Boston Latin America's headquarters office in Sao Paulo, Brazil is a new 30-story building with its name sign on top of the building. The Bank Boston sign is an LED lighting system from Act One Communications (CA). The pixel-based lighting technology provides a versatile to enhance the beauty of the building. The sign is a state-of-the-art color-changing LED lighting system is employed to light up the huge 18' high by 92' long bank name sign. The technology uses flexibly linked lighting pixels behind the sign face. Those pixels, as they are not bound on a rigid surface, can fit into any surface configuration regardless of its shape and size: 2D, 3D, flat, segmented, curved, spherical, to name a few. Each lighting pixel is weatherproofed and composed of several red, green and blue LED's that can generate up to one-billion brilliant colors regulated by an IC chip inside. The pixel is 1.75" in diameter and weighs only one ounce. For the Bank Boston sign, there are 4,000 pixels used, distributed evenly at 4" spacing. With a compact digital controller, each pixel can be addressed individually, thus allowing maximum flexibility and variations for the color pattern design. The huge sign consumes a maximum power of 4,000 watts, but while in operation with the color changing continuously, it only draws about 1,200 watts - the same as a household hair dryer! Source: PR WEB.