LCD TV Association

Inform ○ Promote ○ Improve ○ Connect

“LCD TV Matters”

Volume 1, Issue 2

"A Great TV in Every Room"

Contents

Chairman's Corner: Thoughts on WAF, CES, Holiday Shopping and what's next...

by Bruce Berkoff

Welcome to our Fall 2007 LTA newsletter issue and the hottest point of the Holiday selling season!

We are clearly in the midst of the biggest buying binge of flat TVs ever, yet two trends emerge already:

- One is that LCD TVs are going mainstream in a big way, with vast acceptance and affordability in a broad array of styles and brands, with a price point for every niche and a product for every price point!
- The second thing I notice is that the shortages in panel supplies earlier in the year has led to exactly what we predicted, a real lack of great deals on smaller more affordable sets, like 32-inch LCD TVs. In fact, I know of one company in the Bay Area that bought a 32-inch Magnavox last year for $500 and bought the same thing this year for $600 -- not the standard trend we are used to in the consumer electronics space!

There were certainly some good deals out there for Black Friday (and Saturday!) and others since, but many of the most interesting were on the 37- and 42-inch and larger sizes, which are still coming down in price a bit. For example: here on the "left coast," the November. 23rd Oregonian had an ad from Standard TV and Appliance with a 42-inch LG LCD TV at $848 after rebate, not much more than their 32-inch model at $623 after rebate. Toshiba had a 1080p 42-inch reduced to $1248 in the same ad, along with a 32-inch that had a neat built-in DVD for $798. (Great product, but someone needs to think a bit more about marketing a brand name in English like "Regza").

In any event, CES will be fast upon us, and we shall see what next year has in store for the LCD world very soon. Last year's CES was quite interesting, with ever larger LCD panel sizes being shown by LG.Philips LCD and Sharp (much larger than shipping sets this year for sure) and some great electronics and full set solutions some in unlikely places. For example, one of the best image quality LCD TV sets I ever saw was in Panasonic' booth, but it was not so easy to find back in the corner behind all the commotion they were making about their larger (and corporate focused) Plasma line-up. Of course, Panasonic made clear that their larger sized TVs would be Plasma, but they had a great line up of "smaller" LCDs, but perhaps that boundary line between the two might change over time (see below).

In the photo on the left are Bob Pinnel, (former CTO of USDC) and Bruce Berkoff (former LPL CMO and Chair of LTA), at the 2005 GFPC in Okinawa Japan. The photo on the right shows an Olevia 747, with a stylish high "WAF" design!

SEMI (http://www.semi.com/) which has for years had major shows in the semiconductor equipment and material space, started the "GFPC: Global FPD Partners Conference" in Japan a few years back, and their 2008 event will be held in Nagasaki April 11-14. (*https://semireg.smartseminar.jp/public/seminar/view/5*). I mention it here due to the interesting statements made at the April 2007 conference by Fujio Nakajima-san, CTO and EVP of Panasonic. He was speaking about the great internal video processing solutions they developed for both LCD and Plasma sets, but when asked about the fantastic performance of their LCD TV line and the larger unit volume market in LCDs, he noted that "of course we must eventually make bigger LCD sets like 37- and 42-inch as the volume is driving the market in that direction." But, the timescale for these events was unclear, as was the fact that he was probably speaking logically rather than stating a corporate policy. I bet it will be ever more interesting to see what great LCD TVs are hidden inside of Panasonic's beautiful CES booth!

As I have noted for years, LCDs are popular due to their interior design element and high "WAF" (Wife Acceptance Factor), but I am betting that by this CES 2008 or certainly by CES 2009, you start to see the next big trend in high WAF products (beyond the ever slimmer, lighter, and lower power LCD TV sets we must push for as you will read about later n this issue), and that is the LESS CABLE CLUTTER products due to WIRELESS audio and video (I believe wireless audio from the TV out will happen more widely first, and later wireless HDMI, with "DEEP & WIDE"™ color (my name for the RIGHT thing to call it) will happen from a tuner box to the TV. Now, many may note some wireless audio solutions already exist, but I find them very low quality, expensive, and low tech compared to what I see coming around the corner, but more on that in later issues.

In this issue, we have some great new updates on Q3'07 TV market growth and 1080P market premiums, as well as a focus on "green" technology, like our new Green TV™ program and logo for TVs with ambient light sensors to offer better energy conservation and lower eyestrain. We even have an interview discussing new packaging technology from NOVA Chemicals, which can make boxes smaller and stronger, allowing for more per truck and, thus, much lower shipping cost per box and of course lower energy use and a better carbon footprint for our precious biosphere.

Every day, in every way, we want to strive to make LCD TVs just that much better for you, and your parents, to learn about, buy and use. Speaking of that, keep a look out for our "HDTV Holiday Buyers Guide" which should be out soon, and which indeed started as an email to my parents when they wanted to know "how to shop for a new HDTV". It will be coming to a website near you (even Amazon's) in the not too distant future! Our intent is to actually make it easier to shop for all types of TVs, not just LCDs, and as always, we welcome your comments and feedback.

Warmest regards,

Bruce Berkoff, Chairman, bruce@lcdtvassociation.org
LCD TV Association
"A Great TV in Every Room"

Mr. Berkoff is the founding Chairman of the LCD TV Association, a global not-for-profit trade association dedicated to "informing, promoting, improving and connecting" the entire LCD TV supply chain and their related companies, to help promote *"a great LCD TV in every room in the house!"* For over six years, residing in Seoul Korea, Mr. Berkoff was also the Executive Vice President of Marketing and Chief Marketing Officer (CMO) for LG Philips, LCD. He has also been the CEO of a fabless semi start-up in the video processing space and general manager of Philips Flat Display Systems software and electronics business. Prior executive positions also include UMAX Computer Corporation, Radius and SuperMac Technologies. Mr. Berkoff is also a speaker and author in the display and electronics industry. He has display related patents, both granted and pending in the US and China. He holds an undergraduate degree in physics from Princeton and a graduate degree in biophysics from the University of California at Berkeley. Mr. Berkoff currently sits on the boards of four publicly traded companies: InFocus Corporation (INFS), Syntax-Brillian Corporation (BRLC), Tvia, Inc. (TVIA) and Uni-Pixel, Inc. (UNXL), and is known for his many visionary talks at display and technology related conferences around the globe.

LCD TV News: High performance and 3DTV

compiled by Veritas et Visus

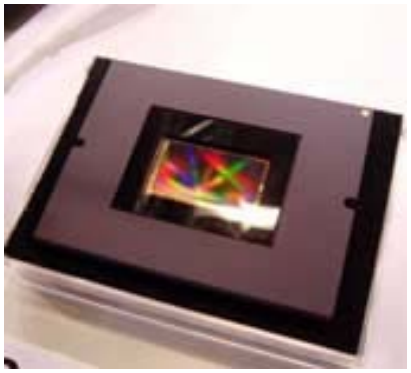
In this edition of the "LCD TV Matters" *newsletter, we feature news about high-performance LCD TV developments and announcements along with information related to the development of 3DTV. Volume one of the newsletter was released a few days ago and features news about display-related standards and component-level LCD TV electronics.*

Barco brings out 56-inch Quad-HD display

Barco announces the availability of a 56-inch quad full high definition display. The LC-5621 complements the company's LC series of 42-inch and 47-inch native full high definition displays with a new 3840x2160 pixel resolution format. The LC-5621 features a configurable ambient light sensor, a wide viewing angle and adjustable color temperature. Barco demonstrated the 56-inch display at the NAB convention in April. The LC-5621's large size and video quality make it an ideal display solution for studio backdrop applications and broadcast control rooms, where multiple video inputs need to be monitored. The adjustable color temperature setting enables users to maintain perfect color balance under all studio lighting conditions. For high-quality distribution of video sources, the LC series can be combined with Barco's multiviewer product family or networked broadcast monitoring systems (NBMS). http://www.barco.com

NHK develops 33-megapixel imaging sensor for Super Hi-Vision camera

Engineers at NHK's (Nippon Hoso Kyokai) Science and Technical Research Laboratories recently showed off a 33-megapixel image sensor for their Super Hi-Vision (SHV) camera which supports a 7680x4320 format, currently under development as the next generation TV format. Until now, the sensors in NHK's prototype SHV camera had half the resolution of an SHV image. Using the new sensor an entire SHV screen can be captured with a single sensor. A prototype SHV camera fitted with the sensor was set up about 3 meters away from a scene that included a newspaper. It was possible to read the stories printed on the newspaper on a monitor displaying the image. The same thing would not be possible on today's HDTV systems. The first sensor is monochrome and NHK says a color image is possible by simply using three in a camera, one for each primary color. Shooting an image in SHV is only one of the challenges facing broadcasters before such a system can be introduced. An uncompressed SHV signal has a bit-rate of 24G bps (bits per second) and that's unmanageable for broadcasting systems. It needs to be compressed. But real-time encoding and decoding of such a high-bandwidth signal is also a challenge. NHK and Fujitsu are working on the problem and have at least solved the real-time part. By linking 16 encoders in parallel an SHV signal can be compressed to around 1/200th of its size using MPEG-4 AVC/H.264 compression. The result is a Super Hi-Vision image of 128Mbps, which is still about six times the bandwidth of today's high-definition broadcasting in Japan, but within the realms of possibility for future broadcasting systems. http://www.nhk.or.jp



NHK partners with Ateme for Super Hi-Vision encoding technology

NHK has chosen encoding technology from Ateme for use in its first public demo in Tokyo of Super Hi-Vision (SHV) with MPEG-4 AVC (H.264). SHV is tentatively scheduled to debut as a bona fide format by 2009, with introduction of a full specification, according to Ateme, as SHV cameras, recorders, encoders and projectors are now being developed. While compression is a big factor in dispersing content via today's HD formats (at least for cable and DBS), compression technology is of even greater interest to SHV proponents. According to Ateme, less than 20 minutes of uncompressed footage consumes about 3.5TB. (One minute alone eats up 194GB). Ateme's MPEG-4 AVC compression technology will attempt to dramatically reduce that demand. http://www.ateme.com

Xerox scientists simplify color matching process

In late April, Xerox announced that a team of scientists have begun working on a new technology to simplify color adjustments in a document. Geoffrey Woolfe, principal scientist in the Xerox Innovation Group, says users will be able to type "make the sky a deeper blue" or give a voice command "make the background carnation pink" and the software does the work. The invention, still in the research stage, creates "color language" by translating human descriptions of color into the precise numerical codes that machines use to print color documents. Woolfe's discovery means that color adjustments could be made on devices like color office printers and commercial presses without having to deal with the mathematics. For instance, cardinal red on a printer or monitor is really expressed by a set of mathematical coordinates that identify a specific region in a three-dimensional space, which is the gamut of all the colors that the device can display or print. To make that color less orange, the color expert distorts (morphs) that region to a new region in the gamut. The ability to use common words to adjust color would have far-reaching implications for non-experts as well as graphic artists, printers, photographers and other professionals who spend a significant amount of time fine tuning the colors in documents. Xerox has filed for patents on the technology. http://www.xerox.com/innovation

JVC launches LCD TV line featuring second-generation high-speed technology

JVC announced a new line of full HD LCD televisions featuring the company's second-generation high-speed LCD technology. The new flat panel sets feature the company's Clear Motion Drive II technology with a 120 frames per second (120Hz) frame rate, double the typical rate, to deliver crisp fast action images. To further enhance performance, the new line uses 10-bit LCD panels for more accurate color reproduction and more natural gray scaling. JVC's technology will be offered in three new sets – the 37-inch LT-37X898, the 42-inch LT-42X898 and the 47-inch LT-47X898 (*photo*). The technology's second generation, Clear Motion Drive II, has been designed specifically for full HD (1920x1080) displays and improves motion detection fivefold compared to the original high-speed driver. To reduce blurring of moving images, JVC's CMD II uses a frame doubling driver (120Hz) and motion interpolation. A JVC algorithm detects the movement in images and increases the frame rate to 120Hz to create an interpolated image that is displayed as two frames – the original plus the newly interpolated frame – in the same time it takes a conventional (60Hz) set to display a single frame. This delivers moving images without blurring or flickering. And compared to other frame doubling technologies, inserting an interpolated frame maintains image brightness. To further enhance performance, JVC's CMD II TVs use a 10-bit IPS LCD panel, which renders more than one billion colors for rich, natural color reproduction, provides natural gray scaling and provides 64 times smoother gradation than does an 8 bit panel. To get the most out of the advanced 10-bit 120Hz panel, JVC's high-speed LCDs feature the company's fifth generation D.I.S.T. (Digital Image Scaling Technology) engine on the JVC-exclusive 32-bit Genessa chip, which combines all core image processing circuits together in a single chip that allows for faster communication among circuits. The panel also features IPS (In Plane Switching) technology for a wide 178-degreee viewing angle. Specifications include a contrast ratio of 2000:1, 4.5 ms response rate, 500 cd/m^2 brightness, and a 178-degree viewing angle. http://www.jvc.com

Prototype display from National Chiao Tung University adjusts pixels to improving viewing angles

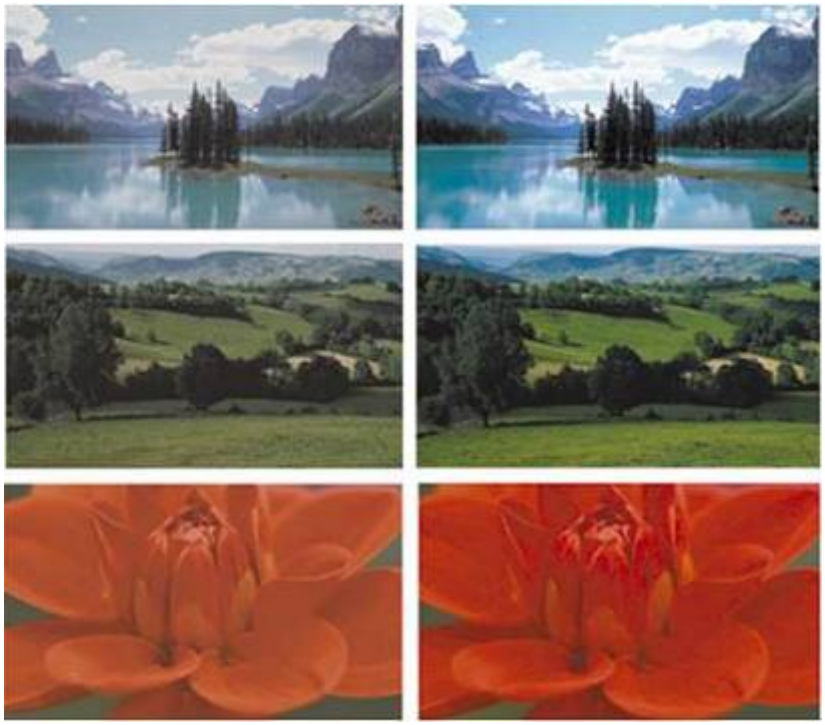
A new display system developed by engineers at the Photonics and Display Institute, National Chiao Tung University in Taiwan, could enable the LCD to alter itself based on your viewing location. The researchers have devised a solution in which a camera tracks the eyes of the onlooker and subsequently uses software to adjust the "orientation of liquid crystals in the display and the power fed to light-emitting diodes behind each". The result is an image that remains clear and sharp regardless of how you're looking at the screen, and while the developers admit that it can only respond to one set of eyes at a time, they're hoping that "doctors and surgeons who use LCDs to view scans or X-rays" would be among the first to benefit. http://www.nctu.edu.tw

New Hitachi technology overcomes "judder"

Hitachi unveiled a film processing technology it claims solves a problem that has challenged television design engineers for more than 50 years. Through a technology innovation called Reel60, Hitachi applies a patented technique that correctly matches the motion of movies to the motion that appears on television. As a result, viewers can experience movies at home on a Hitachi television in the pure and precise way the movie creators intended, the company said in a press statement. Reel60 technology is available in three new HDTV flat panel displays Hitachi introduced on June 28: the new Full HD (high-definition) 1080 50-inch HDTV (model P50V701), as well as its Director's Series Full HD 1080 HDTVs in both 50-inch (model P50X901) and 60-inch (model P60X901) screen sizes. Since Hollywood movies flash 24 individual images each second, and our TV screens show 60 frames each second, a conversion technique called "3:2 pulldown correction" is used to make the 24 frames of film fit the television's faster 60 frames. As this conversion is done, the viewer can often observe a jerky, troublesome visual effect that is called "judder". It appears as if the image is jittery or stuttering and is especially noticeable when the picture pans or makes sweeping, side-to-side movements. With Hitachi Reel60, a patented new technique is applied that accurately and automatically eliminates the jerky motion, the company claims, smoothing out the movement and correctly matching the original motion. http://www.hitachi.com

Sony announces BRAVIA X2550 LCD TV series with x.v.Color

Sony rolled out the BRAVIA X2550 series of HDTVs in Japan, all featuring 1080p resolution, wide color gamut backlighting, 120Hz Motionflow Technology, BRAVIA Engine, and Sony's new x.v.Color technology supported by dual HDMI 1.3-compatible inputs. The series supports a third HDMI port on the side to enable easy connectivity for camcorders and other portable devices. Models include the 52-inch KDL-52X2550 for 720,000 yen, 46-inch KDL-46X2550 for 490,000 yen and 40-inch KDL-40X2550 for 420,000 yen. Interestingly, although extended color gamut will unlikely be viewable to most people visiting Sony's website, the company nevertheless shows some examples that supposedly represent the improved colors, as depicted in the images to the right. Sony's BRAVIA advertising has made a splash with its creative program emphasizing color. The most recent effort shows thousands of colored bunnies made out of Play-doh hopping and morphing through the streets of New York City... http://bravia.sony.eu/bravia.html



A new BRAVIA ad used 2-1/2 tons of Play-doh to create colorful bunnies delighting New Yorkers one sunny day…

Philips introduces LCD TVs with 4 trillion colors

Philips recently introduced LCD TVs at 47- and 52-inches that boast a specification of 4 trillion colors (14-bit), as well as Philips' Perfect Pixel HD and 2-channel Ambilight technologies. The Perfect Pixel HD Engine is a technology where each pixel of the incoming picture is enhanced to better match the surrounding pixels, resulting in a more natural picture. Artifacts and noise in all sources from multimedia to standard TV and also in highly compressed HD content are detected and reduced ensuring that the picture is clean. 2-channel active Ambilight enhances the viewing experience by producing ambient light to complement the colors and light intensity of the on-screen image. It adds a new dimension to the viewing experience, completely immersing you into the content you are watching. It creates ambiance, stimulates more relaxed viewing, and improves perceived picture detail, contrast and color. Ambilight automatically and independently adapts its colors according to the changing content on the screen. The new TVs also feature 120Hz Clear LCD to improve the appearance of motion. The Double Frame Rate Insertion increases the sharpness of motion reproduction to more than twice that of conventional LCD, resulting in a response time of 3 milliseconds (measured in Perceived Blurr-Edge-Width; BEW). The devices also come with a USB connector to allow access to multimedia files of most USB-sticks and digital cameras (USB 1.1 memory-class device), and 3 HDMI ports. The displays measure 500 nits, 8000:1 contrast, and 1920x1080 pixels. http://www.consumer.philips.com

LG's Pause & Play gets Freeview playback certification

LG Electronics announced that its Pause & Play TVs with built-in digital video recorders (DVR) received the Freeview Playback certification from the UK's Digital Television Group. The DTG is the UK's industry association for digital television. It set technical standards for DVR in 2006 and also created guidelines for consumers who are looking to purchase digital video recorders as the UK prepares to change over to digital broadcasting by 2008. There are two levels of Freeview Playback certification. To attain the first level a DVR must be able to record essential program information including audio, video, subtitles and closed captions. Second level certification requires that the DVR have an advanced programming guide that can make intelligent decisions about when to schedule recording times. LG's Freeview Playback certified Pause & Play TVs comes in three LCD models at 32-, 37- and 42-inch sizes. http://www.lge.com

Toshiba introduces REGZA LCD TVs featuring the "worlds' thinnest LCD TV bezel"

Toshiba introduced what they call "Practically All-Screen TVs" featuring ultra-thin frames less than 1-inch wide, allowing a larger TV in a smaller space. These new REGZA Super Narrow Bezel (SNB) models will be available in 40- and 46-inch screen sizes. The new SNB models feature new 10 Bit LCD Panels for a richer and more accurate picture with 64 times the colors of an 8 Bit Panel. To further enhance picture quality, these models also feature xvYCC signal support to accept 1.8x more colors than standard HD signals, and come with Toshiba's PixelPure 3G 14 Bit internal Digital Video Processing with 4096 levels of gradation, DynaLight dynamic backlight for deeper blacks, and ColorBurst wide color gamut CCFL for enhanced color rendition. Connectivity includes 3 HDMI digital inputs, all with CE-Link HDMI-CEC control for optimum ease-of-use. For PC Gamers, SNB models also feature a PC input capable. The 40-inch model lists for $899.99 while the 46-inch model is $2499.99. http://www.tacp.toshiba.com

Samsung launches 70-inch LCD TV

Samsung introduced a 70-inch (1920x1080) LCD TV to the Korean market; the largest full high-definition LCD TV currently available. The new TV employs an LED backlight instead of conventional CCFLs, supporting a 120Hz refresh rate. Samsung's unique local dimming technology enables the LED backlight to be turned off in dark image areas, delivering a dynamic contrast ratio of 500,000:1. At the same time, power consumption is lowered by as much as 50%. The system supports three HDMI 1.3 ports. Samsung introduced the product worldwide in the October 2007. Pricing is ₩59,000,000 (about $63,000). http://www.samsung.com

Samsung brings out F8 and F9 series of LCD HDTVs

Samsung Electronics announced a new line of large-screen LCD TVs with the latest in high definition picture technology. The goal of the new F9 series TVs (52 and 70 inches) is to roll out the new LED smart lighting technology, known as “local dimming,” in some of the largest screen sizes available in the marketplace. Samsung also packages the lineup with its patented Full HD 1080p super clear LCD panel (52 inch) and Wide Color Enhancer to deliver superior HD quality with blacker blacks, more vivid colors and ultra-sharp images. LED smart lighting uses multiple LED backlight units. The TV intuitively senses the TV signal and adjusts the brightness level by turning on and off the right combination of the backlight units to produce a dynamic contrast ratio of 500,000 to 1. The F9 line also comes with Wise link USB 2.0 for handy connections to digital cameras and MP3 players, and three HDMI connections that allow the users to take advantage of the Full HD capability of their various components, such as Blu-ray Disc players, game consoles, and HD camcorders. The 52-inch versions come equipped with Samsung’s Auto-wall mount feature, allowing the viewer to easily change the viewing angle up to 20 degrees side to side and 15 degrees down using the remote control. The F8 series includes 40/46 inch models and features its 100Hz MotionPLUS technology which enhances motion to eliminate blur in quickly moving pictures. Scrolling at a fast 100 Hz, the F8 uses advanced algorithms in Samsung’s new 100Hz MotionPLUS processor to create a middle frame between image movements, intelligently anticipating the action and leaving the viewer with more natural and smoother images. Samsung’s patented super clear LCD panel and Full HD 1080p technology delivers blacker blacks and a high dynamic contrast ratio of 25,000:1, at resolutions nearly two times sharper than conventional HDTVs (1920x1080 resolution). Samsung has also equipped the F8 line with its Wide Color Enhancer, which boosts color detail and luminance by creating a wider range of colors and makes traditionally weak greens and blues deeper and more vivid. http://www.samsung.com/ifapress

Samsung’s F8 series of LCD TVs features 40 to 46-inch systems; the new F9 series is comprised of 52 to 70-inch devices.

Samsung to ship "Bordeaux" LCD TVs at a 10,000:1 contrast ratio

Starting in April, Samsung initiated shipments of 32- and 40-inch LCD TVs in the Bordeaux line-up, featuring a 10,000:1 contrast ratio. The devices also feature three HDMI ports, with one of them providing front-side access. Additionally, the overall design scheme showcases a curved transparent base. Pricing is expected to be $1700 and $2600 for the 32-inch and 40-inch models respectively. Both are expected to be introduced at 1920x1080 pixels.

LG.Philips LCD demos 47-inch LED backlit-LCD with 1,000,000:1 contrast ratio

LG.Philips LCD recently demonstrated a 47-inch LED backlit LCD TV that boasts what the company calls "Mega CS" and claims is measured at a 1,000,000:1 contrast ratio. This panel brings a Full HD 1920x1080 resolution, obtained through a process of local dimming. The panel is also listed at a brightness of 500 nits, a 178-degree viewing angle, 8-ms response, and 1.07 billion colors covering 105% of the NTSC color gamut.

On the left is Samsung 40-inch LCD TV at a contrast ratio of 10,000:1. On the right is a new panel from LG.Philips with an LED backlight that reportedly supports a contrast ratio of 1,000,000:1.

Dolby Laboratories acquires BrightSide Technologies

Dolby Laboratories is to acquire BrightSide Technologies, the pioneer of high dynamic range (HDR) image technology, for approximately $28 million. The transaction was completed in the third quarter of Dolby's 2007 fiscal year. BrightSide is a development-stage technology company focused on enabling the capture, distribution, and display of more vibrant video on mass-market LCD TV sets, as well as front-projection and rear-projection TVs. "Dolby has built its strong reputation and brand by delivering products and technologies that make the entertainment experience more realistic and immersive, and BrightSide's HDR image technology complements that strategy," said Bill Jasper, president and CEO, Dolby Laboratories. "Acquiring BrightSide reflects our long-term focus on delivering innovative technology solutions to our licensees and their customers." http://www.dolby.com.

Sharp develops 108-inch LCD TV

Sharp has developed a 108V-inch LCD TV, the world's largest. The company exhibited a prototype model at CES. The 108V-inch LCD screen, which measures 2386 x 1344 mm, features a "Black Advanced Super View Full-Spec" HD LCD panel manufactured at Sharp's Kameyama Plant No. 2, the first plant in the world to use eighth-generation glass substrates. With a pixel format of 1920x1080 pixels, although the device enables "full HDTV", viewers will not be able to get very close to the device without noticeable pixellation; pixel density translates to only 20 pixels per inch – perhaps the lowest level in the TV industry. http://sharp-world.com

Sharp introduces AQUOS P Series of TVs: world's first 22 and 26-inch 1080p LCDs

In late October, Sharp introduced 22-inch and 26-inch LCD TVs at 1920x1080 pixels, world-first products at that resolution. Sharp also introduced a 32-inch version. All three models come with DVI-D and mini D-Sub connectors along with 2 HDMI ports, S-Video and 2 composite hook-ups. This new AQUOS P range features built-in tuners, a 400cd/m2 brightness, 176-degree viewing angle, and a 2000:1 contrast on the 32-inch model, dropping off to 1200:1 on the 22-inch set. The LC-32P1-W, LC-26P1-W, and LC-22P1-W models are expected to range from ¥240,000 to ¥180,000 when they start shipping on November 22nd in Japan. http://sharp-world.com

Sharp shows off 62-inch TFT LCD at 4096x2048 pixels

Earlier this year, Sharp showed off a 62-inch TFT LCD at 4096x2048 pixels (8.3 megapixels). Rather than targeting a quad-HDTV level, Sharp seems to be interested in supporting the DCI standard associated with high resolution image capture. With cinema cameras increasingly expected to capture images at 4096x2048, Sharp's target market would seem to be to the film industry to help them quickly edit digitally captured images. Eventually, this strategy might apply to the home, should the raw high resolution images captured by the filmmakers are ever made available to the public. http://sharp-world.com

Sharp breaks ground on 10th generation fab

On December 1 Sharp broke ground on their next generation LCD and solar cell factory in Sakai City, Osaka Prefecture, Japan that it calls a "Manufacturing Complex for the 21st Century." Sharp is aiming to make this a major industrial zone: in addition to the horizontal deployment of its proprietary thin-film technology to cutting-edge LCD panel and solar cell plants, Sharp is inviting relevant infrastructure and material and equipment manufacturers to construct their plants on the site. This will push the vertically integrated business model created at the Kameyama Plant further upstream in the supply chain and achieve a vertically integrated model that transcends company borders. It will also allow Sharp engineers to work closely with their counterparts in leading material and equipment manufacturers, thus giving rise to new technical innovations through shared knowledge and expertise. The LCD panel plant is scheduled to start operation by March 2010 and it will be the first facility to use tenth-generation glass substrates (2850x3050 mm), the worlds largest. The solar cell plant is also set to start production by March 2010. The site measures 1.27 million m^2 and will require an investment of approximately 380 billion yen (including land acquisition costs). The main products planned by Sharp are LCD panels for large-screen LCD TVs in the 40-, 50- and 60-inch class. Input capacity will ultimately be 72,000 substrates per month (initial capacity at start of operations: 36,000 substrates per month). http://sharp-world.com

Syntax-Brillian signs agreement to sell LCoS operations

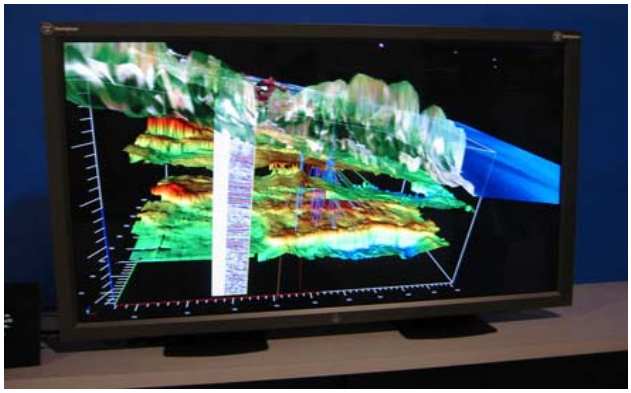
In late October, Syntax-Brillian announced that it signed an agreement in principle to sell its operations in Tempe, Arizona dedicated to the manufacture of LCoS microdisplays and light engines. Under the terms of the agreement, the company will retain all patents and intellectual property associated with LCoS but will license the technology to Compound Photonics Ltd. (a UK-based company with an office in Portland, Oregon.) in exchange for an equity interest in Compound Photonics. Compound Photonics will use its equity to acquire the LCoS manufacturing equipment and inventory and will assume the lease on that portion of the Tempe facilities used in the LCoS operations. Syntax-Brillian will focus its efforts on its Olevia-branded LCD TV business. http://syntaxbrillian.com

DisplaySearch indicates 23% of LCD TVs outsourced in Q3'07

On December 5, DisplaySearch released its Q3'07 LCD TV Value Chain Report, which states that 23% of the 20.1 million LCD TV units shipped in Q3'07 were made by external OEMs such as TPV, Jabil, AmTRAN, Quanta, Proview, Vestel and Wistron. Many LCD TV brands outsourced 100% of their LCD TV set manufacturing, such as Grundig, HP, Polaroid, Vizio, ViewSonic and Westinghouse. Philips outsourced more than 60% of its LCD TVs shipped in Q3'07 to OEM makers. Some brands intend to increase their outsourcing share for certain regions and products as the market expands, while other brands intend to bring more volume in-house as they expand into new regions. http://www.displaysearch.com Highlights of the Q3'07 LCD TV Value Chain Report include:

- More than 2 million LCD monitor panels shipped in Q3'07 were used for LCD TVs, which is a big leap from 900K in Q2'07.
- 23.7 million LCD TV modules were shipped from TFT LCD makers, while LCD TV manufacturers shipped 20.1 million units. These variances were mainly due to supply chain, assembly lead time, buffer stocks and channel inventory.
- TPV led the TV set subcontract manufacturing market with a 19.9% share in Q3'07, followed by Proview, Jabil and AmTRAN. The main customer for TPV is Philips, and the main customer for AmTRAN is Vizio. The main customer of Proview is Polaroid, and the main customer of Jabil is Philips.

Westinghouse and Eyevis show displays at 3840x2160 pixels



Westinghouse has again been showing off a 56-inch TFT LCD solution at 3840x2160 pixels. Using a panel from CMO, the panel reportedly was not featured, but was inauspiciously located in the back of the booth. Westinghouse showed the same solution at CES in 2006, but seems to have kept a commercial launch on the back-burner, reportedly now focused on trying to appeal to high-end scientific markets and abandoning plans to offer a TV that could simultaneously show four HDTV stations. A German company by the name of Eyevis also recently announced their EYE-LCD5600QHD using the same CMO panel. Eyevis says it will promote the product at the upcoming ISE event in Amsterdam. http://www.eyevis.de

HP to enhance MediaSmart TV concept

At the iSuppli FID conference on December 4, HP's VP of the Managed Home, Jim Sandusky, pre-announced plans to enhance HP's MediaSmart TV offering. At CES 2008, the company expects to "bridge the PC/TV divide and help the display industry in delivering a digital lifestyle of enjoyable content consumption from ALL video sources". The enhanced product will include the Extender for Windows Media Center which will enable HD entertainment live from your PC direct to your TV. This requires a PC with Windows Vista Home Premium or Ultimate and a network connection. For existing MediaSmart TV customers, HP will provide a free firmware upgrade. Sandusky's news came at the end of his presentation about HP's efforts to popularize a networked TV – the most recent version of the MediaSmart TV was launched in August 2007. He noted that HP expects the networked TV market will expand from about 100,000 units in 2007 to more than 5 million units by 2010. The growth will be fueled by continued expansion of home-based wireless connectivity as well as broadband piped into the home. He noted that the digitization of personal content is happening very quickly – such that digital information used and manipulated by the individual in one room of the house, but desires to show it easily on displays in other areas of the home. Photo, video, and music streaming, TV recording (even HD) using an interactive programming guide, on the TV, will all be enabled by the MediaSmart TV concept. http://www.hp.com

De Montfort University paves the way to 3D television

Three-dimensional television in the home could become a reality thanks to a multi-million pound project to develop a new system led by researchers at De Montfort University, Leicester, UK (DMU). The Multi-User 3D Television Display (MUTED) project aims to develop a practical 3D television system, which has not been achieved before. The project is worth Euro 4.5 million (roughly £3 million) and is supported by Euro 3 million (about £2 million) of funding from the European Commission's Framework 6 program. Researchers at DMU's Imaging and Displays Research Group (IDRG) are leading the work to create a 3D viewing experience without the need for special glasses. Several viewers will be able to watch the screen at the same time and will also be able to move around the viewing room and still see 3D wherever they sit. The project will also investigate ways in which 3D technology can enhance medical scans, allowing doctors and scientists to explore the resulting images in greater detail using 3D displays. There are six other participants in the consortium: Fraunhofer HHI, Germany; the Eindhoven University of Technology, the Netherlands; University of West Bohemia, Czech Republic; Sharp Laboratories of Europe; Biotronics3D; and Light Blue Optics. The MUTED display will be the first system to use color lasers, holographic projection technology and a new optical system design. http://www.dmu.ac.uk

ITRI forms 3D display alliance with panel makers

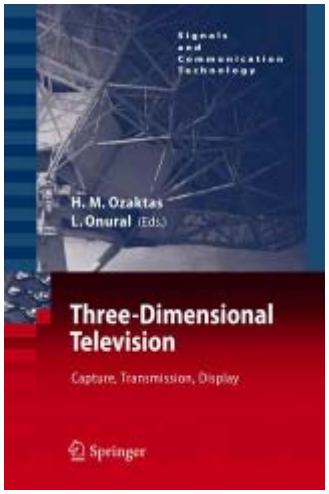
Taiwan's Industrial Technology Research Institute (ITRI) recently formed the 3D Interaction & Display Alliance with Taiwan LCD panel makers, including AU Optronics (AUO), Chi Mei Optoelectronics (CMO), Chunghwa Picture Tubes (CPT) HannStar Display, and digital TV content suppliers as well as several system makers. ITRI suggested that the 3D display market will grow from $300 million in 2007 to over $2 billion in 2010. Taiwan panel makers such as CMO and CPT have already developed 3D LCD panels, with CMO set to volume produce 22-inch 3D panels in the third quarter while CPT's 20.1-inch wide-screen panel has gained attention from first-tier display vendors, according to sources. http://www.itri.org.tw

SENSIO Technologies and JVC combine on 3D broadcasting

SENSIO Technologies announced, in collaboration with JVC, what the companies claim to be the introduction of the first complete solution for broadcasting live 3D sporting and cultural events. They say that it is now possible to "repurpose" the current 2D broadcast infrastructure to deliver 3D content. The new "SENSIO 3D Live!" encoder simplifies the entire 3D production process. Common technical issues such as image synchronization have been resolved. It also has 3D pre-visualization for easy camera alignment. By being compatible with standard 2D equipment, the encoder allows producers to overlay 3D graphics in real time and offer instant 3D replays. SENSIO plans to implement live 3D in theaters before the end of 2007. http://pro.jvc.com

Ozaktas and Onural edit new book about "Three-Dimensional Television"

The scope of a new book entitled "Three-Dimensional Television: Capture, Transmission, Display", reflects the diverse needs of this emerging market. Different chapters deal with different stages of an end-to-end 3DTV system such as capture, representation, coding, transmission, and display. In addition to stereographic 3D solutions, both autostereoscopic techniques and holographic approaches are also covered. Some chapters discuss current research trends in 3DTV technology, while others address underlying topics. In addition to questions about technology, the book also addresses some of the consumer, social, and gender issues related to 3DTV. The 800-page book is expected to be available in early December. In hardcover, the book is priced at $269.00/€199.95/£154.00. http://www.springer.com



SD&A 2007 "Discussion Forum" about 3D TV now on-line

At the 2007 Stereoscopic Displays and Applications (SD&A) event in San Jose, a panel discussion was conducted on the topic, "3D in the Home: How Close Are We?" The discussion was moderated by Lenny Lipton (far left) from REAL D, and from left to right, included Brett Bryars from the USDC, Art Berman from Insight Media, Mark Fihn from Veritas et Visus, and Steven Smith from VREX. Transcripts of the forum are now on line: http://www.stereoscopic.org/2007/forum.html

Lenny Lipton, Brett Bryars, Art Berman, Mark Fihn, and Steven Smith

Philips 3D display used by Deutsche Telekom to demonstrate interactive 3DTV at CeBIT

Deutsche Telekom demonstrated interactive television in 3D on Philips 3D WOWvx display at CeBIT in Hanover, Germany last month. The Philips 42-inch 3D displays showed high-definition stereo film especially created by Germany based KUK-Filmproduktion. The stereo film was recorded in February at the Eisenbach Studios in Munich, Germany using a setup with two high-definition cameras and converted into 3D using Philips 3D Solutions Stereo-to-3D conversion software. The high-definition 3D video stream is transmitted over Telekom's high-speed network (ADSL+). Philips 3D WOWvx displays, whereby viewers can experience 3D without the use of special glasses, are in use today for professional applications such as in store advertising and other public display applications. http://www.business-sites.philips.com/3dsolutions

HDNet makes 3D + 4K plans

Media entrepreneur Mark Cuban, founder of HDNet, says the hi-def network will eventually go all 4K with a mix of 3D. Cuban, the co-founder of HDNet, said the 4K cameras from Red Digital Cinema have been ordered, and plans for field tests are under way. HDNet currently originates its own material in 1080i and upconverts the rest. Cuban said there are plans to do the type of live HD streaming to theaters that the Metropolitan Opera launched earlier this year. http://www.hd.net

Cleveland Cavaliers watch the finals in 3D HD

On June 10, fans of the Cleveland Cavaliers were treated to a special 3D HD presentation of Game 2 of the 2007 National Basketball Association finals. 14,000 tickets were all distributed free of charge and were all distributed within two hours of being made available. The game was captured with four of Pace's Sports Fusion 3D HD camera systems. Then using TI DLP projectors, it was displayed on four 46-feet 3D screens at the Cavalier's Quicken Loans Arena. The "Cavaliers 3D HD Experience" was presented by FSN Ohio, and was billed as the first-ever live game in pro sports shown to the public in 3D HD. All fans were given special 3D HD viewing glasses courtesy of the Cavaliers and FSN Ohio. "This is a great way to say thanks to our fans for all their support during the Cavaliers run to The Finals," said Dan Gilbert, majority owner of the Cleveland Cavaliers. "This groundbreaking 3D HD event will provide our fans with a new way to experience the excitement of watching the game and make them feel like they are sitting courtside in the AT&T Center in San Antonio." http://www.nba.com/cavaliers

NBA All-Star game is first-ever live high-definition 3D sports telecast

A select group of sports fans watched the National Basketball Association All-Star game in the first-ever live high-definition 3D sports telecast on February 18. The NBA hosted a telecast at special screening rooms at the Mandalay Bay Resort & Casino in Las Vegas. Seated there were some 600 executives from sports, theater owners and broadcasting companies. Sony stacked two of its digital 4K projectors to bring the 3D images to two, 40-foot silver screens provided by Real D, whose 3D projection system is the most widely used in US theaters for screening 3D films. The filming was done with five of Pace's specially designed Sports Fusion 3D HD camera systems to capture the entire basketball game. Each 3D HD camera is designed with two HD cameras that work together to create one visual experience. "Our hopes are to understand the emerging technology and where our world of entertainment is going and to be part of that, and maybe to direct it," said Michael Rokosa, vice president of engineering for NBA Entertainment. Rokosa said the technology could be used to take the live sports arena experience to local theaters, and any future developments would include TV broadcasters that have rights to the live games. Pace Technologies was founded by "Titanic" movie director James Cameron and camera designer Vince Pace. Cameron is now shooting "Avatar," his next film, in 3D using the Pace Fusion camera. The cameras were virtually stationary to avoid overwhelming viewers' senses, and audio will come from courtside instead of the announcers' booth. http://www.nba.com/allstar2007/news/3d_hd_070212.html

Philips launches 2D to 3D conversion products

Philips Electronics showcased the capabilities of its 3D content-enabling software, for converting existing high-definition 2D commercials and professional stereo video footage into 3D for visualization on Philips professional 3D displays, at CES in Las Vegas. Philips 3D displays using WOWvx technology deliver out-of-screen 3D effects without the need for special glasses or filters. Philips has developed a suite of 3D content-enabling software, to unlock the customer's new and existing material for visualization in 3D using the "2D-plus-depth" format. This includes plug-ins for animation software, OpenGL Control for real-time applications, and semi-automated video conversion from 2D to 3D as well as real-time stereo to 3D conversion tools. Philips semi-automated 2D to 3D conversion tool can use existing high-definition 2D video as input. An operator can manually indicate depth information to key-frames. The software uses these to automatically calculate the depth information for each of the image frames of the remaining part of that scene. At CES, Philips showed a commercial that has been converted from the original 2D material into barrier bursting 3D. High-definition stereo video footage can be converted in real-time with the Philips stereo-to-3D conversion tool. It calculates the depth information using the disparity between the left and right image. To demonstrate the potential of visualizing stereo video on Philips 3D displays, Philips showed a production that was created using a stereo high-definition (two) camera setup. Philips WOWvx 3D content enabling software, Open GL Control and the 3D animation software plug-in are now available from the company. The semi-automated 2D-to-3D conversion tool and the Stereo-to-3D tool will be commercially available in Q2 of 2007. From February 2007 onwards, Philips will provide semi-automated 2D to 3D conversion and Stereo-to-3D content conversion services to selected customers. http://www.philips.com

Philips introduces WOWzone 132-inch 3D display wall

In late August at IFA in Berlin, Philips introduced the 3D WOWzone, a large 132-inch multi-screen 3D wall designed to grab people's attention with stunning 3D multimedia presentations. Philips claims that the out-of-screen 3D effects fascinate viewers and holds their attention for longer than standard 2D images, thereby making 3D a valuable marketing tool. No glasses are needed to view the Philips 3D WOWzone and it gives marketeers an element of surprise that leaves their target audience with an entertaining 3D multimedia experience. The Philips WOWzone multi-screen 3D wall consists of nine 42-inch Philips 3D displays in a 3x3 display set-up. A fully automated dual mode feature allows the user to display 3D content as well as 2D high-definition content. Philips WOWzone is a complete end-to-end solution including 3D displays, mounting rig, media streamer computers, control software and dedicated 3D content creation tools. The WOWzone is available today on a project basis and will be commercially available from Q1 2008 onwards.

Philips and eventIS demonstrate 3D video-on-demand feasibility

In early September, Philips and eventIS announced that they successfully completed testing of 3D video-on-demand (VoD) using an eventIS metadata system and Philips 3D displays. This proves that the new 3D video format, based on "2D-plus-depth", can be integrated into existing media distribution and management systems such as video-on-demand via cable, satellite, Internet or terrestrial broadcasting. Earlier this year Deutsche Telekom and Philips demonstrated interactive 3D applications like movies, home shopping and online games. Now eventIS takes this a step further, by demonstrating that 3D VoD capabilities can easily be implemented in their metadata media management system. According to the company, VoD will play an important role in the early distribution of high-quality 3D movies to the consumer. In the demo, eventIS makes use of a library that consists of 3D animated, stereoscopic and 2D-to-3D converted videos. http://www.philips.com/newscenter

On the left is the Philips 3D WOWzone 132-inch 3D display wall; the image on the right depicts 3D video-on-demand

Eclipse 3D Systems combines monochrome and color to produce 3D

Eclipse 3D Systems announced a new patent-pending technology for displaying 3D movies in theaters and homes. The Eclipse 3D technology promises to be less expensive and brighter than polarized projection, which some theaters have used to show 3D movies. The new technology is applicable to digital projectors and flat panel displays opening the possibility of distributing high quality 3D through most of the major movie distribution channels including movie theaters, DVD sales and rental, and digital TV. The Eclipse 3D technology combines a monochrome image with a full-color image to produce full-color 3D. The 3D images can be viewed with Eclipse colored filter glasses. The images can be projected on any white screen or surface. Since a silver screen is not needed, the Eclipse 3D format is less expensive and more portable than the polarized format. Due to the properties of the human visual system, the monochrome image is perceived with a brightness gain of about four times while not contributing significantly to color vision. This process is similar to night vision, although the full-color image is perceived with normal brightness and color. Color perception comes almost entirely from the full-color image. The gain in brightness for the monochrome image means that little brightness is used in adding 3D to a display. As such, Eclipse 3D images are about 4X brighter than polarized alternatives. http://www.eclipse-3d.com

One of the most surprising aspects of the Eclipse 3D format is that full color perception can be obtained from only one eye. This 3D pair contains a red monochrome image and a full-color image, in which case the observed color in the 3D image is full-color. For even better color, put a red filter from a pair of red/cyan glasses over your left eye.

Pavonine shows 24-inch 3D LCD monitor

At CeBIT in March, Korea's Pavonine showed off their forthcoming 24-inch stereoscopic display, featuring 1920x1200 pixels. The MIRACUBE G240S is 2D/3D switchable with polarized glasses, (and so only supports 1920x600 pixels in 3D mode. No word just yet on pricing. The company is also reportedly preparing a 32-inch 3D LCD monitor. http://www.dimen.co.kr

Zalman demos 19 and 22-inch 3D displays

Zalman showed off two 2D/3D switchable monitors at CeBIT; one 19-inch 1280x1024 model targeted at gamers, and the other a 22-inch widescreen 1680x1050 model. Both of the displays require the user to wear glasses to combine the stereo images, although Zalman promises that the price of these monitors will undercut the competition.http://www.zalmanusa.com

Fraunhofer Research demonstrates autostereoscopic Free2C display

Fraunhofer Research showed off its Free2C 3D Display at IFA in late August, claiming it to be "currently the most advanced development in autostereoscopic (glasses-free 3D) display technology". Free2C is based on a special head-tracking lenticular-screen 3D display principle, allowing free head movements in three dimensions at a high level of image quality (the current resolution is 1600x1200 pixels). The particular design of the lens plate ensures that the stereoscopic images are almost perfectly separated (no ghosting). The Free2C-Desktop Display is perfectly suited for virtual prototyping, archaeology and oceanography, minimal invasive surgery and lifelike simulations. The researchers claim that the viewer can be freely positioned without degradation to resolution, brightness, and color reproduction, all with "extremely low crosstalk". http://www.hhi.fraunhofer.de

iZ3D ships 22.0-inch dual LCD 3D gaming monitor

In late August, San Diego-based iZ3D commenced selling a 22.0-inch widescreen 3D gaming monitor for $999 – specifically targeting the gaming market. iZ3D says the system works using custom software drivers, and the user must wear passive polarized glasses. iZ3D is a newly-formed partnership between 3D imaging developer Neurok Optics and Taiwan's Chi Mei Optoelectronics. The monitor itself offers a 1680x1050 pixel format, 5 ms response time, 170° viewing angle, 600:1 contrast, and dual DVI/VGA inputs designed to connect to a dual-output video card. The display ships with stereo drivers which are compatible with either the nVidia GeForce 8 series or ATI's FireGL V3600 workstation graphics cards. The monitor incorporates two LCDs and can also be used for standard 2D computing tasks. http://iz3d.com

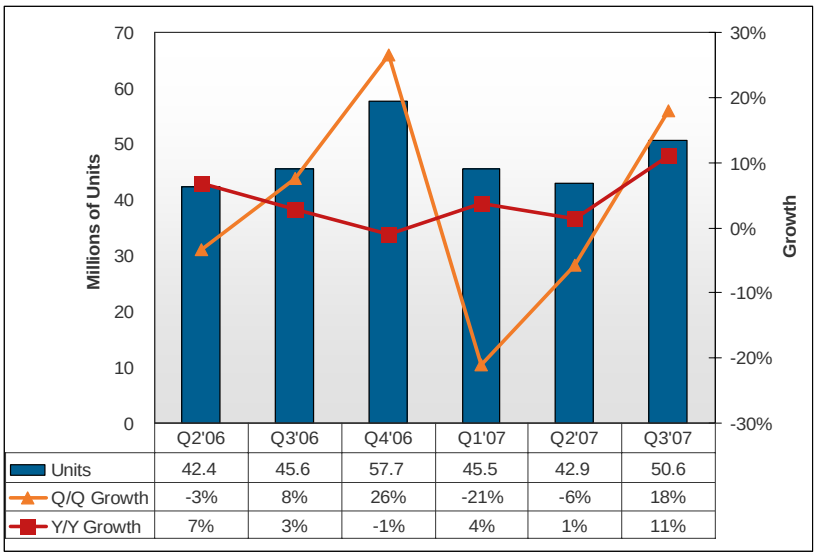
Q3'07 global TV market enjoys double-digit growth on strength in Europe, developing regions and at 1080p

by Ross Young

Ross Young is the founder and president of DisplaySearch. Prior to founding DisplaySearch in 1996, he served in senior marketing positions at OWL Displays, Brooks Automation, Fusion Semiconductor and GCA in the driver IC, flat panel automation, etch and strip and lithography markets respectively. Ross attended the University of California at San Diego (UCSD), Australia's University of New South Wales, UCSD's Graduate School of International Relations and Pacific Studies and Japan's Tohoku University.

TV shipments rose 18% Q/Q and 11% Y/Y to 50.6 million while revenues rose 17% Q/Q and 10% Y/Y to $26.3 billion in Q3'07 as reported in our latest *Quarterly Global TV Shipment and Forecast Report* and shown in Figures 1 and 2. The strong growth can be attributed to:

- **Rapid growth in Europe.** Because the European TV market stalled in Q3'06 as sell-through during the World Cup disappointed and resulted in a 19% Q/Q decline in revenues, TV revenues were bound to surge on a Y/Y basis. In fact, Q3'07 European TV revenues jumped 25% Y/Y with units up 29%. Sequential growth was particularly impressive in Eastern Europe as flat panel TVs rose from 37% of Q2'07 shipments to 50% of Q3'07 shipments.
- **Healthy growth in the developing world.** TV revenues for Asia Pacific, Latin America and Middle East & Africa were up a combined 19% Y/Y with units up 11%. While the World Cup contributed to weakness in Q3'06 in these regions, rising income levels, falling TV prices and increased flat panel TV penetration also contributed to their rapid growth. The combined flat panel share for these regions doubled from 8% of Q3'06 shipments to 16% of Q3'07 shipments. China also had a strong quarter and was the largest TV market on a unit basis for the second time over the past three quarters. China experienced 9% Y/Y unit growth and 4% Y/Y revenue growth.

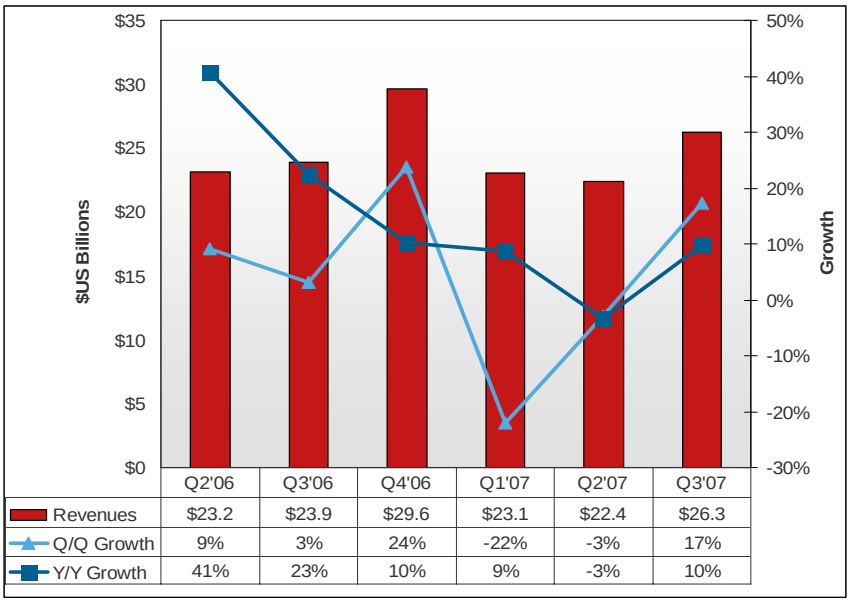


	Q2'06	Q3'06	Q4'06	Q1'07	Q2'07	Q3'07
Units	42.4	45.6	57.7	45.5	42.9	50.6
Q/Q Growth	-3%	8%	26%	-21%	-6%	18%
Y/Y Growth	7%	3%	-1%	4%	1%	11%

Table 1: Global TV shipments and growth

- **Enormous growth in 1080p TVs.** 1080p TVs rose 70% Q/Q and 357% Y/Y to 3.4M. Each technology offering 1080p TVs enjoyed tremendous 1080p unit growth with 1080p LCD TVs up 69% Q/Q, 1080p plasma TVs up 101% Q/Q and 1080p microdisplays up 57% Q/Q. As a percentage of 40-inch and larger TVs, 1080p sets rose from 29% to 39% of units and 40% to 51% of revenues led by Japan and North America where 1080p sets accounted for a majority of 40-inch and larger units as shown in Figure 3. The growth in 1080p sets despite their higher prices helped minimize blended ASP declines for all TVs which were down just 1% Y/Y to $519.

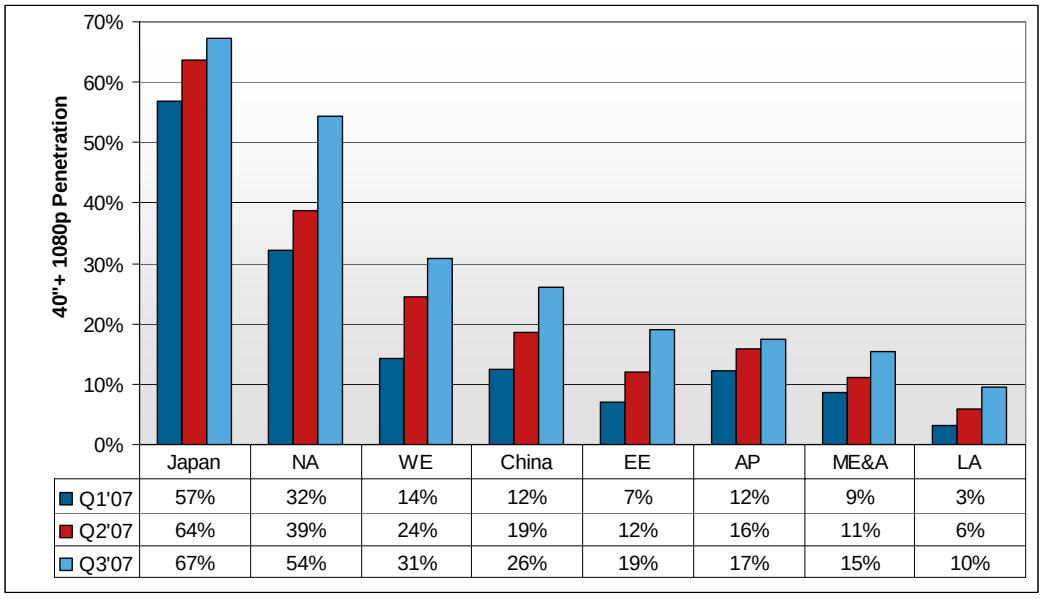
- **Continued gains by flat panel TVs and larger sizes.** Flat panel TV shipments were up 75% Y/Y with LCDs up 86% and plasma growing 21%. Flat panel TVs accounted for more than 80% of Q3'07 shipments in Japan, Western Europe and North America and 45% worldwide, up from 29% in Q3'06. Flat panel TV revenues also continued to take share, rising 21% Q/Q and 29% Y/Y to an 81% share, up from 69% in Q3'06. The average TV size also continued to grow, rising from 25.6-inch in Q3'06 to 27.4-inch in Q3'07 with 40- to 47-inch TV shipments and revenues rising the fastest and now accounting for nearly 1/3 of TV revenues.



	Q2'06	Q3'06	Q4'06	Q1'07	Q2'07	Q3'07
Revenues	$23.2	$23.9	$29.6	$23.1	$22.4	$26.3
Q/Q Growth	9%	3%	24%	-22%	-3%	17%
Y/Y Growth	41%	23%	10%	9%	-3%	10%

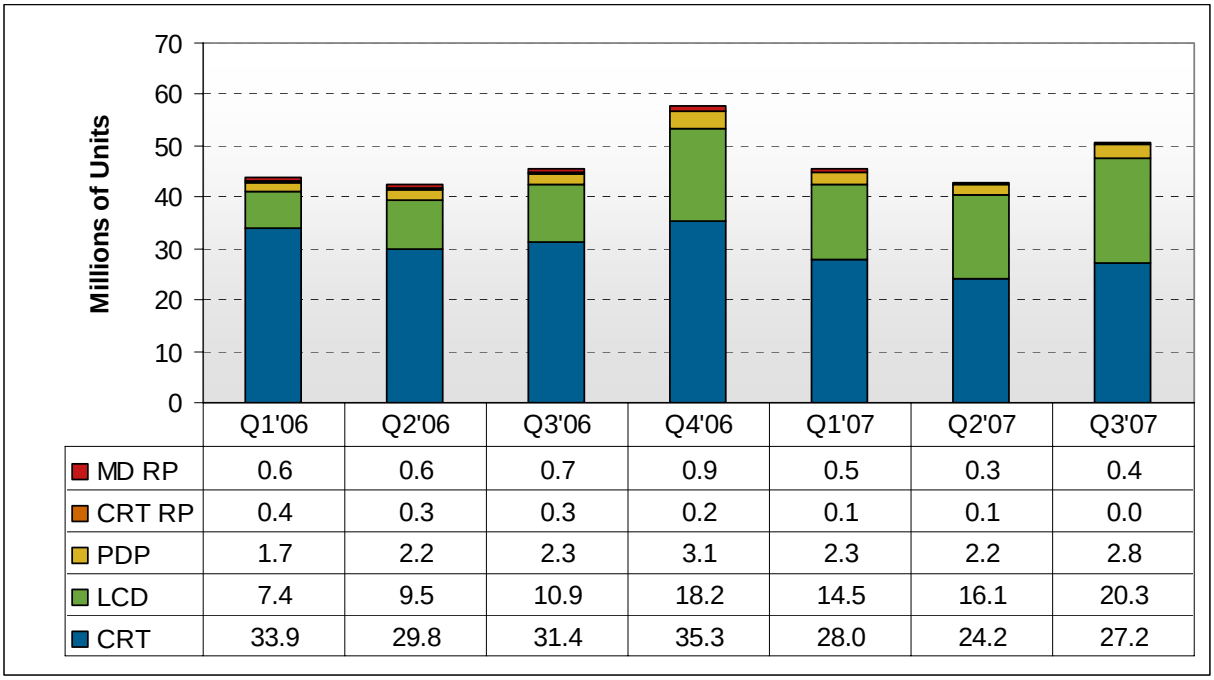
Figure 2: Q3'07 global revenues and growth

LCD TV shipments accelerated in Q3'07 rising 26% Q/Q and 86% Y/Y in Q3'07 to a record 20.3M units as shown in Figure 4 and a 40% unit share of the TV market. LCD TVs remained the only technology to enjoy Y/Y revenue growth, up 48% Y/Y to $17.5B and a 66% revenue share of the TV market. ASPs were down 20% Y/Y to $861, the slowest decline since Q3'06 due to gains by larger sizes and 1080p as well the impact of constrained panel supply on individual panel prices. The average LCD TV size rose from 31-inches to 32-inches with 19-, 26-, 40-, 46-, 47-, and 52-inch all enjoying impressive growth. 40-inch and larger LCD TVs rose to 23% and 43% of the LCD TV market on a unit and revenue basis respectively. LCDs took share from plasma at 40- to 44-inch with their share rising from 63% to 66% and at 50- to 54-inch where their share grew from 13% to 23%. 1080p LCD TVs accounted for 14% of units, up from 10% in Q2'07, and 31% of revenues, up from 24%. In the case of 40-inch and larger LCD TVs, 1080p accounted for a majority of units for the first time at 51% in Q3'07 vs. 42% in Q2'07. By region, North America overtook Western Europe to become the leading region for LCD TVs followed by China. In terms of brand share, the rankings were the same on both a revenue and unit basis with Samsung leading on a dollar basis for the third consecutive quarter and unit basis for the fifth consecutive quarter. As shown in Table 1, Sony and Sharp took share on significantly faster growth than the rest of the top 5. By region on a revenue basis, Sharp led in Japan, Sony led in North America, Samsung led in Eastern and Western Europe as well as in Asia Pacific, Latin America and Middle East & Africa. In China, Hisense, Skyworth and Sony were in a virtual tie for #1. At 1080p, Sony overtook Sharp to lead with a 20% to 19% share followed by Samsung at 16%.



	Japan	NA	WE	China	EE	AP	ME&A	LA
Q1'07	57%	32%	14%	12%	7%	12%	9%	3%
Q2'07	64%	39%	24%	19%	12%	16%	11%	6%
Q3'07	67%	54%	31%	26%	19%	17%	15%	10%

Figure 3: 40-inch+ 1080p penetration



	Q1'06	Q2'06	Q3'06	Q4'06	Q1'07	Q2'07	Q3'07
MD RP	0.6	0.6	0.7	0.9	0.5	0.3	0.4
CRT RP	0.4	0.3	0.3	0.2	0.1	0.1	0.0
PDP	1.7	2.2	2.3	3.1	2.3	2.2	2.8
LCD	7.4	9.5	10.9	18.2	14.5	16.1	20.3
CRT	33.9	29.8	31.4	35.3	28.0	24.2	27.2

Figure 4: Q1'06 – Q3'07 TV unit shipments

Plasma TV shipments were up 24% Q/Q and 21% Y/Y to 2.8M units and a 5.5% share of the TV market, up from 5.0% in Q3'06. Japan, North America and Western Europe all had 10% penetration of plasma TVs in Q3'07 while other regions were as low as 2%. Plasma TV revenues were up 13% Q/Q but fell 19% Y/Y to $3.8B and a 14% share, down from 20% in Q3'06 on significant price reductions and slower average size gains due to the re-introduction of 32". Plasma TV ASPs fell 9% Q/Q and 33% Y/Y to $1373, while the average size only increased slightly from 44.8" in Q2'07 to 44.9" in Q3'07 with the 50-inch and larger share rising 30% to 31% of the market on a unit basis and 44% to 47% on a revenue basis. 1080p plasma TVs rose from 6% to 10% of plasma TV units and 14% to 21% of revenues. While plasma fell from 36% to 34% of the 40- to 44-inch market, 1080p plasma TVs took share. At 50- to 54-inch, plasma remained dominant with a 67% share, down from 70%, but 1080p plasma took significant share in this category. Plasma TVs continue to encroach on RPTVs with their 55- to 59-inch share rising from 18% to 34% and their 60-inch+ share rising from 22% to 24%. By region, North America remained the largest region for plasma TVs with a 32% share followed by Western Europe at 25% and Asia Pacific at 14%. Panasonic remained the market leader in Q3'07 with a 33% revenue share as shown in Table 2 and maintained the #1 position in Japan, North America, Eastern Europe, while overtaking Hitachi for #1 in China. Samsung enjoyed its highest share to date at 21% and overtook Panasonic for #1 in Western Europe. LGE led in Asia Pacific, Latin America and Middle East & Africa. Pioneer overtook Philips to earn the #5 position, enjoying the fastest growth of the top 5 brands on the launch of its new Kuro line of high performance plasma TVs.

Table 1: LCD TV Brand Revenue Share and Growth

Ranking	Brand	Q2'07	Q3'07	Q3'07 Q/Q Growth
#1	Samsung	18.6%	18.4%	22%
#2	Sony	13.2%	15.1%	39%
#3	Sharp	11.1%	12.5%	38%
#4	Philips	10.1%	9.6%	16%
#5	LGE	8.4%	7.6%	11%
	Other	38.7%	36.9%	17%
	Total	100.0%	100.0%	22%

Table 2: PDP TV Brand Revenue Share and Growth

Ranking	Brand	Q2'07	Q3'07	Q3'07 Q/Q Growth
#1	Panasonic	35.6%	32.9%	4%
#2	Samsung	19.4%	21.3%	24%
#3	LGE	16.2%	16.3%	14%
#4	Hitachi	7.4%	7.9%	22%
#5	Pioneer	4.2%	6.3%	68%
	Other	17.3%	15.4%	0%
	Total	100.0%	100.0%	13%

MD-RPTV unit shipments rose 9% Q/Q but fell 50% Y/Y to 370K units and a 0.7% share, down from 1.6% in Q3'06, on continued share losses to flat panels. ASPs were up 5% Q/Q on gains at 1080p and at larger sizes, but fell 19% Y/Y on severe price competition with flat panels to $1643. The average diagonal rose to a record high of 55.5-inches, up from 53.9-inches, on share losses at smaller sizes. With the size gains, the 1080p share surged from 52% to 74% of shipments. By technology, DLP remained dominant with a 57% share, down from 63%, on flat growth. 3LCD accounted for a 26% share with LCOS at 17%. North America and Asia Pacific were the only regions to enjoy Q/Q growth and North America continued to dominate with its share rising from 92% to 95% of revenues. 55-inch and larger sizes rose from 53% of Q2'07 to 65% of Q3'07 shipments. By brand, Sony reclaimed the unit advantage a 0.5% share lead over Samsung at 31.7% to 31.2%, but Samsung maintained the revenue advantage with a 29.3% to 28.6% advantage over Sony. Mitsubishi jumped to #3 with a 20% unit share. On a unit basis by region, Samsung led in Asia Pacific and North America, JVC led in Japan, Sony led in Western and Eastern Europe, Latin America and Middle East & Africa while Changhong led in China.

By TV brand:

- Samsung was the #1 brand on a unit basis for the fifth consecutive quarter with its highest share to date at 14% on 24% Q/Q growth as shown in Table 3. It was also the #1 brand on a revenue basis for the seventh consecutive quarter with a 17.9% share, also its highest share to date as shown in Table 6. Samsung was either #1 or #2 on a unit or revenue basis in each technology - #1 in LCD TV units and revenues, #2 in plasma TV units and revenues, #1 in CRT and MD-RPTV revenues and #2 in CRT and MD-RPTV units. Contributing to its long run at #1 are its strong brand, regional strength, focus on all major technologies, sizes and resolutions and top 2 capacity position in CRTs, LCDs and PDPs. By region, it was #1 in the 3 of the 4 largest regions on a revenue basis – North America, Western Europe and Asia Pacific – as well as Eastern Europe. It was also #1 in 720p/1080i share at 19.5%. No other supplier had more than a 10% share.
- LGE was the #2 brand on a unit basis for the fifth consecutive quarter, but fell from #2 to #3 on a revenue basis, losing ground to Sony. On a revenue basis, LGE remained #1 in Latin America and Middle East & Africa. By technology on a revenue basis, it was #2 in CRTs, #3 in PDPs and #5 in LCDs.
- Sony rose from #3 to #2 on a revenue basis and remained #4 on a unit basis. It had the highest unit growth and second highest revenue growth of the top 5 brands. On a revenue basis, it was #2 in LCDs and MD-RPTVs. Sony and Sharp were in a virtual tie in 1080p share across all technologies at 19.5%.

Table 3: TV Brand Unit Share and Growth

Ranking	Brand	Q2'07	Q3'07	Q3'07 Q/Q Growth
#1	Samsung	13.1%	13.8%	24%
#2	LGE	11.8%	11.2%	12%
#3	Philips	8.0%	6.9%	3%
#4	Sony	5.7%	6.2%	26%
#5	TCL	5.3%	5.6%	25%
	Other	56.0%	56.3%	18%
	Total	100.0%	100.0%	18%

Table 4: TV Brand Revenue Share and Growth

Ranking	Brand	Q2'07	Q3'07	Q3'07 Q/Q Growth
#1	Samsung	17.6%	17.9%	20%
#2	Sony	9.7%	11.1%	34%
#3	LGE	10.1%	9.3%	8%
#4	Sharp	7.3%	8.4%	36%
#5	Philips	8.5%	7.9%	9%
	Other	46.9%	45.3%	13%
	Total	100.0%	100.0%	17%

DisplaySearch's TV market intelligence including panel and TV shipments, panel supply and demand, TV shipments by region by brand by size by resolution, rolling 16-quarter forecasts, TV cost/price forecasts, design wins and panel roadmaps can be found in its ***Quarterly Global TV Shipment and Forecast Report*** which is now available in separate modules.

WitsView reveals 1920x1080 street price survey results

40-inch wins the title of being the most premium-priced 1920x1080 TV; Japan enjoys highest penetration at 1920x1080

WitsView is a neutral market research firm dedicated to the TFT-LCD industry, providing a full coverage of information resources and analytical research to over 1,800 companies worldwide. WitsView's service consists of all-round quantitative research, bottom-up industry analysis and insightful market viewpoints that enable clients to make prompt and convinced decision. http://www.witsview.com

Based on WitsView's survey, the worldwide Oct-07 retail price of 1920x1080 (FHD) LCD TVs were more than 10% higher than lower-resolution models (HD). The 40-inch FHD TVs saw the largest difference, reaching 39%, an indication of the huge price gap between the 40-inch FHD and HD sets. In terms of market penetration, the highest occurred in Japan. The country was the only region to see a more than 50% penetration ratio in the 37~46-inch FHD segment.

FHD vs HD Model LCD TV Street Price 37"~46"

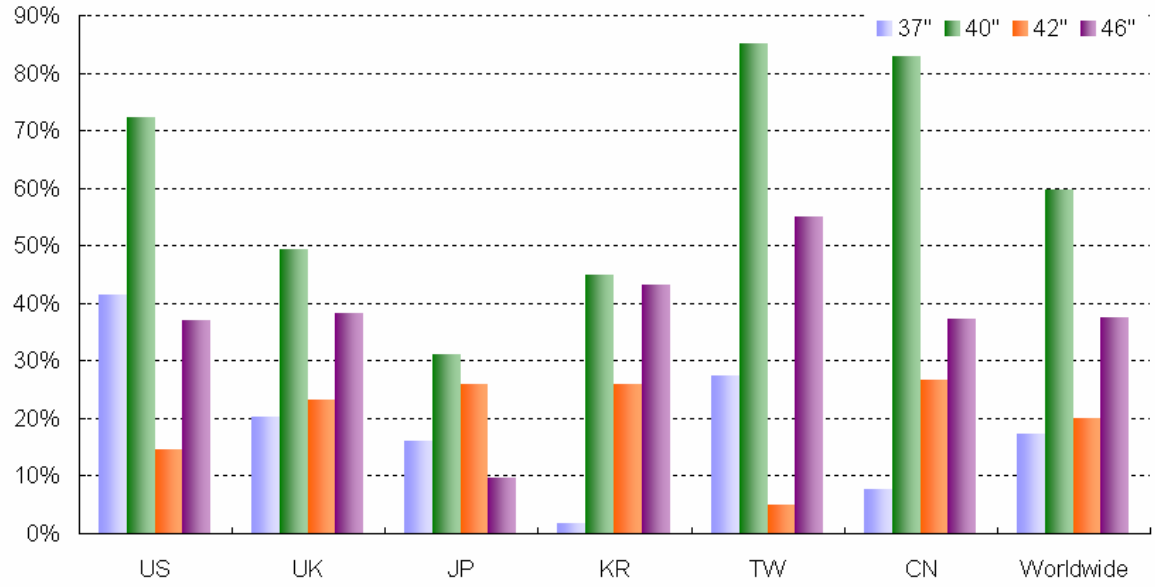
Size	Model	US	UK	JP	KR	TW	CN	Worldwide
37	HD	796	1,027	1,162	1,505	1,062	893	1,074
	Mix	842	1,112	1,281	1,539	1,079	901	1,126
	FHD	1,125	1,234	1,348	1,530	1,354	961	1,259
40	HD	1,015	1,198	1,346	1,538	1,456	1,014	1,261
	Mix	1,341	1,446	1,670	1,548	1,632	1,041	1,446
	FHD	1,749	1,789	1,764	2,227	2,697	1,854	2,013
42	HD	1,057	1,178	1,456	1,447	1,563	1,174	1,312
	Mix	1,127	1,310	1,751	1,514	1,578	1,261	1,424
	FHD	1,211	1,451	1,832	1,821	1,640	1,486	1,574
46	HD	1,446	1,874	2,107	2,247	2,624	1,637	1,989
	Mix	1,830	2,108	2,294	2,645	3,699	1,794	2,395
	FHD	1,981	2,590	2,312	3,219	4,065	2,245	2,735

Source: WitsView, Nov'07

The global average price of the 37-inch FHD and HD models stood respectively at US$1259 and US$1074, a 17% difference. Although the average price of the 40-inch (US$1446) and 42-inch (US$1424) were relatively the same, a striking difference was witnessed in the FHD product lineup. The FHD 40-inch was retailed at US$2013, while the 42-inch entailed a mere US$1574. In addition to being two inches larger, the FHD 42-inch was also more than US$400 cheaper. In the various global markets, the 40-inch FHD products in the U.S., Taiwan and China were more expensive then their HD counterparts by more than 70%. By contrast, the premium 42-inch FHD TVs were approximately below 30% in all regional surveyed markets. As for the 46-inch FHD sets, they were retailed at US$2735, 38% higher than the HD sets.

In terms of the FHD market penetration rate, the larger the TV size the bigger the market share. In the 46-inch FHD model, the average penetration rate was at 70%. Only the Chinese market experienced a ratio below 50%. The FHD 42-inch and FHD 40-inch respectively commanded a share of 40% and 39% in the worldwide average. Minimal differences were also seen in each major market segment except China, where the ratio of FHD models in the 40 class reached merely 13%, lower than the 31% seen in the 42-inch segment. As for the 37-inch, they reached a worldwide average of 27%. Yet, in Japan alone, the FHD models accounted for a whopping 58%.

Full HD Penetration by Region



Source: WitsView, Nov'07

Among the mainstream LCD TV sizes, the 47-inch and above consisted mostly of FHD models (only a few 47-inch sets were WXGA models). Meanwhile, the 37-46-inch category featured either 1366x768 or 1280x720 (HD resolutions) or 1920x1080 (FHD resolution). In the past, the 37-46-inch panels were mainly at HD levels. However, amid the growing 1080i and 1080p content from digital broadcasting, HD disks and game consoles, consumers are showing an increased demand for FHD TVs. Panel and TV set makers are thus rolling out more and more FHD products. Thus, a higher penetration rate is anticipated in the coming future. Moreover, smaller sized FHD LCD TVs are subsequently appearing, as well. For example, in addition to the 32-inch FHD LCD TV that is already being sold, Sharp's 26-inch and 22-inch FHD models are also set to hit product shelves soon.

FHD Penetration by Size

Size		US	UK	JP	KR	TW	CN	Worldwide
37	Avg	100%	100%	100%	100%	100%	100%	100%
	HD	88%	65%	42%	74%	84%	81%	73%
	FHD	12%	35%	58%	26%	16%	19%	27%
40	Avg	100%	100%	100%	100%	100%	100%	100%
	HD	50%	67%	23%	65%	75%	87%	61%
	FHD	50%	33%	77%	35%	25%	13%	39%
42	Avg	100%	100%	100%	100%	100%	100%	100%
	HD	51%	73%	26%	68%	74%	69%	60%
	FHD	49%	27%	74%	32%	26%	31%	40%
46	Avg	100%	100%	100%	100%	100%	100%	100%
	HD	22%	29%	5%	48%	17%	62%	30%
	FHD	78%	71%	95%	52%	83%	38%	70%

Source: WitsView, Nov'07

WitsView provides a monthly analysis of the LCD TV, LCD Monitor and PDP TV in major worldwide markets. In addition, periodic and accurate price info is provided on the increasingly popular FHD LCD TVs in allowing clients to better grasp the market changes in the LCD TV segment. For further information on the FHD retail prices, please visit http://www.witsview.com.

LCD TV Association launches GreenTV program

by Mark Fihn

The LCD TV Association recently launched a logo program to help focus LCD TV manufacturers and brands on reducing the power consumption requirements of LCD TVs. Bruce Berkoff, chairman of the LCD TV Association explained: "We believe LCD TVs already consume the least energy to build, use, and dispose of, but we want to make them even better in the future and have a lighter 'carbon footprint' on the Earth by having the most recyclable parts and highest possible energy efficiencies. This will involve the use of less heavy metals, LED backlights, spatial and content based dimming, smarter electronics, and many other things."

The first step in the LCD TV Association's program is to implement ambient light sensors, which is expected to reduce power consumption by at least 30%. Participants in the program will be awarded with the right to use a GreenTV logo (see adjacent image). The US Environmental Protection Agency (EPA) has estimated that in the US some 4 Terawatt-hours of power were consumed by TVs in 2005. As homes add TVs, consumers spend more and more time watching TVs, and as average panel sizes continue to increase, power consumption is expected to become a bigger and bigger concern.

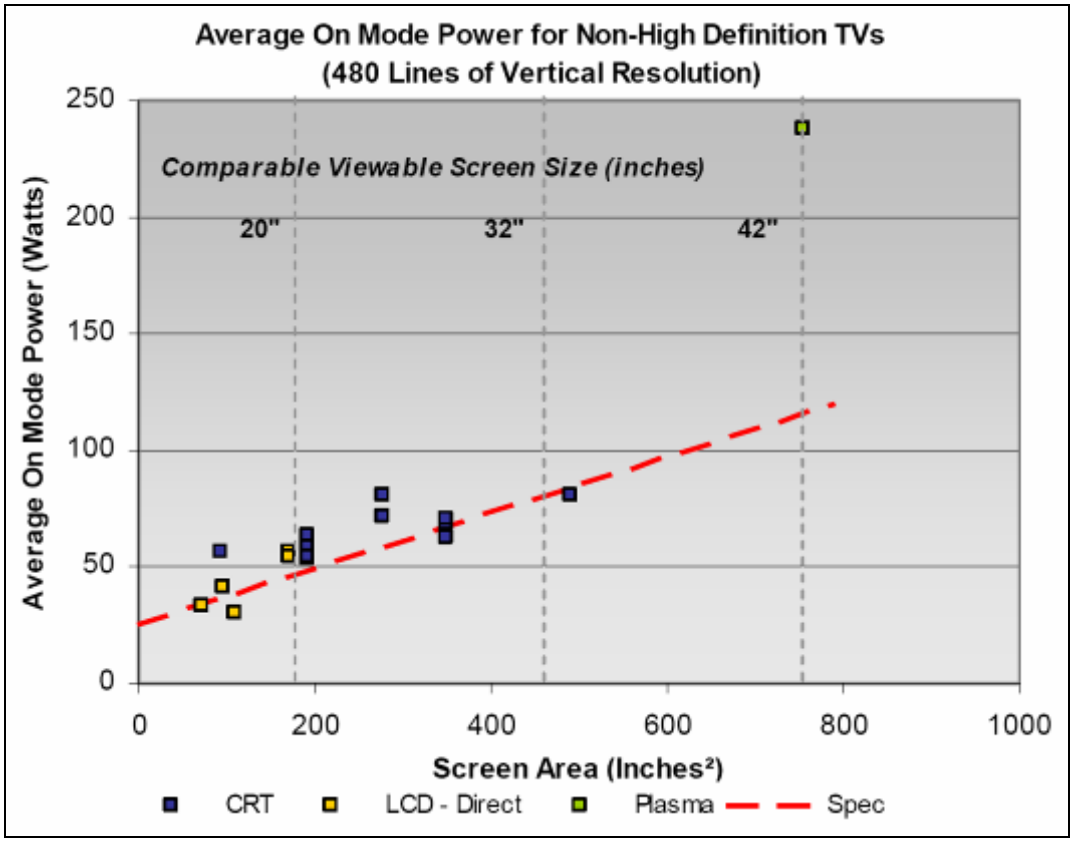
In conjunction with the GreenTV program, the LCD TV Association is cooperating with the EPA's ENERGY STAR program. Currently under discussion at the EPA is the ENERGY STAR TV Product Specification. Representatives from numerous stakeholders in the TV markets (including leading companies associated with LCD, PDP, and rear projection technologies), recently came out with the Draft 2 Version 3.0 ENERGY STAR TV Products Specification. Highlights of Draft 2 include:

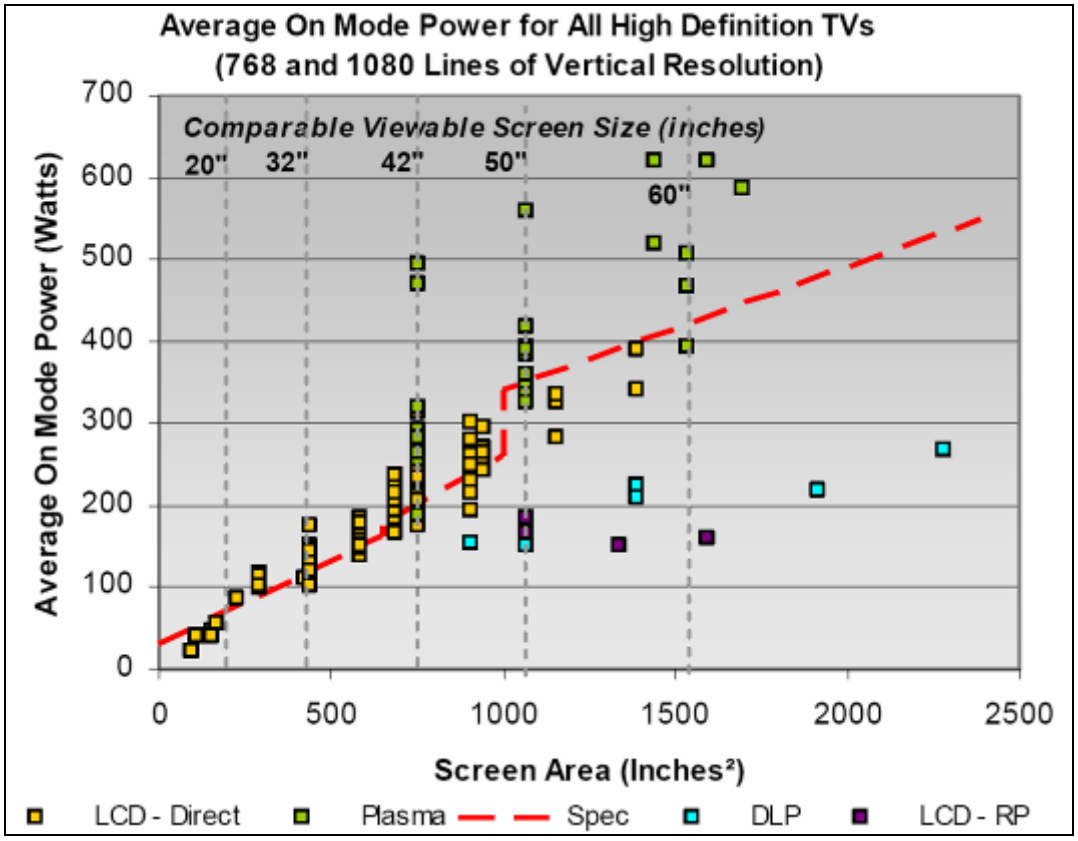
- The specification will be technology neutral, requiring the same power consumption for any technology, differentiated only by panel size and resolution.
- Use of the IEC's TV Power Measurement Standardization Project (IEC 62087 Ed. 2 in IEC's TC100).
- Includes requirement that TV monitors must incorporate Display Power Management Signaling. This ensures that customers who choose to buy a TV monitor and use it with a computer will still benefit from power management savings.
- The ENERGY STAR specification will be a moving target, requiring improvements over time to earn the ENERGY STAR logo.

At its most recent meeting in October, the EPA group discussed several things specific to LCD TVs. Features such as wide color gamut backlighting and motion blur reduction result in higher On Mode power consumption in LCD TVs. As such the ENERGY STAR team was requested to consider On Mode adders for these features that provide additional functionality to the consumer while consuming more power

- Data presented from LCD stakeholders suggest that wide color gamut CCLFs are approximately 20% less efficient than standard bulbs. (This does NOT translate into a 20% increase in On Mode power). Since wide color gamut is expected to be available in 40% of LCD TVs >30" in 2008 (DisplaySearch data), it cannot be considered a premium feature.
- Regarding anti-blur techniques for LCDs, (120 Hz switching with dark, 120 Hz switching with frames, and interpolated frames), such features are beginning to gain traction in higher end displays and expected to become more mainstream during the life of the specification. These anti-blur techniques represent <5% increase in On Mode power that can be overcome through improved optics.
- Since wide color gamut and 120 Hz anti-blur technology will become much more prevalent during the course of the specification, these technologies can be considered part of the inherent "overhead" associated with powering an LCD display. As such, the Draft 2 solution is to allow no adders for these LCD-specific features. In keeping with the technology neutral approach, EPA believes it would be inconsistent to grant adders for a feature to improve the picture for only one type of TV.

Relating to EPA's TV Dataset for the Draft 2 Version 3.0 ENERGY STAR TV Products Specification, the group has made a number of charts publicly available (most recently updated in late November 2007):





Results of the EPA's testing are very interesting, suggesting that LCD TVs perform well in standby mode, but not so well in on-mode. Only 28.3% of the LCD TVs tested would pass the proposed ENERGY STAR requirement. Results of the testing are summarized in the table below.

TV Technology	Total No. of TVs	No. Meet Standby	% Meet Standby	No. Meet On Mode	% Meet On Mode	No. Pass Both	% Pass Both
CRT	8	3	37.5 %	3	37.5%	1	12.5%
LCD	106	94	88.7%	34	32.1%	30	28.3%
Plasma	27	20	74.1%	1	3.70%	1	3.70%
RP-DLP	7	3	42.9%	7	100%	3	42.9%
RP-LCD	3	3	100%	3	100%	3	100%
Total	151	124	81.5%	48	31.8%	38	25.2%

The EPA added that 19 of 30 the TV manufacturers tested (63.3%) represented in the dataset have qualified products. In November, the group reported that "stakeholders argued that the On Mode levels EPA proposed in the Draft 2 Specification were too rigorous and would eliminate large numbers of products and possibly entire technologies from qualifying for ENERGY STAR". As such, the on-mode requirements were reduced, enabling more TVs, particularly at larger sizes, to meet the requirements.

The EPA has calculated the following incremental Savings over 5 years (2008 – 2012):

- Energy saved: 7,051 million kWh – roughly equivalent to the energy needed to power Utah for a year
- Dollars saved (2006 $): $657 million
- Carbon saved: 1.3 million metric tons

Several of the stakeholders at the October meeting made public statements about the Draft 2 Version. Notably, both The Consortium for Energy Efficiency and Texas Instruments (representing rear projection manufacturers) made statements very supportive of the Draft 2 Version of the specification.

Panasonic, representing PDP makers, issued a statement raising several concerns about the Draft 2 Version:

- Putting "all TV technologies into a single grouping ignores marketing realities and consumer preferences". Panasonic encouraged separate classes by technology.
- Panasonic demonstrated that the current draft specification favors TVs at smaller sizes.
- For larger sizes, Panasonic pointed out that rear projection unfairly "pulls down the ENERGY STAR slope". Moreover, they suggested that there is an over-representation by rear-projection in the large-screen FHD category.
- Panasonic also suggested that the EPA's plan to implement the specification in September 2008 should be delayed until Q1'09, since September is in the middle of the model-year production schedule.

Bruce Berkoff of the LCD TV Association states that: "We are highly supportive of the ENERGY STAR efforts and encourage a technology neutral specification that curries no favor to any one TV technology". Berkoff added that as it matures, "the specification needs to get tougher and tougher; the bar needs to be continually raised".

More information about the upcoming Version 3.0 ENERGY STAR TV Products Specification is available online at: http://www.energystar.gov/index.cfm?c=revisions.tv_vcr_spec

Interview with Tim Wong from NOVA Chemicals

Tim T. Wong serves as the general manager for the ARCEL Advanced Foam Resin Business in the Asia Pacific region for NOVA Chemicals. He oversees all aspects of the business throughout Asia Pacific, including manufacturing, marketing and sales. Prior to his current position he was the director of asset development for the ARCEL Business and the director of export sales and marketing for the Styrene Monomer Business, both of which also involved the Asia Pacific region. Tim has a PhD in Chemical Engineering from Northwestern University and an MBA from Rice University. Tim holds two US patents from his work in research and development.

Please give us some background about NOVA Chemicals. NOVA Chemicals produces plastics and chemicals that are essential to everyday life. Our employees develop and manufacture materials for customers worldwide that produce consumer, industrial and packaging products. NOVA Chemicals works with a commitment to "responsible care" to ensure effective health, safety, security and environmental stewardship. Company shares are traded on the Toronto and New York stock exchanges as NCX.

You are promoting your ARCEL foam resin for use in the packaging of electronic goods. Tell us about the science behind this material. ARCEL advanced foam resin is an effective packaging solution for a variety of damage-sensitive goods. Electronic goods are just one area where ARCEL can deliver savings to our customers. The science of ARCEL advanced foam resin is that it consists of polystyrene and polyethylene. ARCEL resin provides the best of both polymers with its exceptional toughness, flexibility, and durability in a lightweight foam.

How is it that the ARCEL foam resin can provide the same level of protection for a device, yet consume much less space? When compared to traditional foams, ARCEL resin resists punctures, flaking, breaking, or tearing. This allows the package designer to use less foam and still maintain the premium protection that consumer electronics require. And when you reduce the size of the foam protection, you consume less space. And this reduction in space helps save money in transportation and logistics costs.

If the same amount of packaging space is consumed by the ARCEL foam resin as with conventional form packaging, would that linearly translate to extra protection from rough freight handling? The protective packaging cushion is only as good as the package design. If the design is done properly ARCEL will give more protection than conventional foam at the same size. This protection is crucial in today's rigorous parcel environment – especially when it is transported on rough roads throughout the world.

Is less ARCEL foam resin actually used as compared to conventional foam packaging, or is the foam simply a more dense mixture? Because of ARCEL's toughness, resiliency, and flexibility, our customers have been able to use less volume of foam, compared to conventional foam packaging materials, at the same density. And by using less volume of foam, their box volume is reduced. This, of course, translates into the space savings we discussed earlier.

Is there anything specific about large-area TVs that attracted you to the market? ARCEL has the potential of helping our customers save money by reducing their damage rate and, more importantly, reducing their transportation and logistics costs. As such, ARCEL can be an effective packaging solution for any customer with damage-sensitive goods. For the large-area TV market, we know we have brought savings to our customers because more and more customers are beginning to use ARCEL. I think it is fair to say that the large-TV market is a market that has an opportunity to reduce its transportation and logistics costs.

So how is it that you can be so effective? The inherent shape of the TV makes ARCEL a great fit (pardon the pun). The shape of a flat-panel display results in a long narrow box. The length and the height of the box are set by the dimensions of the TV, but the width is usually dictated by the amount of cushion packaging. If you reduce the width by a small amount you typically can fit additional units in a shipping container. ARCEL allows designers

to design thinner cushions, thereby reducing the overall size of their boxes while maximizing the protection of the TV. Also, I think it is important to point out one other aspect of the TV supply chain. Competition continues to increase in this market. As competition increases, TV manufacturers must constantly look for opportunities to reduce their costs to maximize their competitiveness and profitability. I believe the TV manufacturers have a wonderful opportunity to look down the supply chain, specifically into their transportation costs, and look for opportunities to reduce their total supply chain costs. I think TV packaging is just such an opportunity.

By shrinking the need for bulky pack material, you can help reduce shipping costs significantly. Please run through a typical financial analysis, say for 40-inch LCD TVs that are manufactured in Shanghai and then shipped to Chicago? Sure, we have done this many times. If you walk into a store and look at a box for a TV you can picture the size of the TV inside. As I said earlier the length and height generally are set by the size of the unit, but the width may have room for improvement. A 40-inch LCD TV may be packaged in a box that is just over 40 inches long and just over 30 inches high with a width of 12 inches. If you can redesign the packaging you may be able to remove a few inches from the width, because the actual width of the TV may be less than 5 inches. For this example, if you were shipping the units in a 40-foot container you would be able to fit the units two across and three high. And each row would take up 1 foot. So you could fit 240 units.

- If you were to redesign this package in ARCEL, you have the potential to reduce the width of the box. For this example let's assume that you can remove two inches from the width and do not change the length and height by much at all.
- If you remove just two inches you can now fit 288 units in the container, which is an improvement of 20%.
- Now assume that shipping from Shanghai to Long Beach costs $3000 per container and shipping from Long Beach to Chicago costs $1500 per container for a total of $4500 for the trip. If you ship 240 units that is at a unit cost of $18.75 and if you ship 288 units that is a unit cost of $15.60 -- an improvement of over $3.00 per unit.

This is just a simplified example, but with proper packaging design, savings like this can be achieved.

Using conventional cushioning foam (left), a large flat-screen television can be packed with only two units to a standard pallet. ARCEL resin (right) allows for cartons approximately half that size, easily doubling the yield.

	Conventional foam	ARCEL resin	Change
Size Comparison			
Length	42.5"	42.5"	0%
Width	14.5"	9.25"	36%
Height	32.5"	30.5"	6%
Cubic volume	20,030 cu. in.	11,990 cu. in.	40%
Units per 40 ft. container	198	330	67%
Units per 48 ft. trailer	112	336	200%
Cost Comparison			
Corrugated cost	$6.05	$3.80	$2.25
Shipping Shanghai to Long Beach	$15.15	$9.09	$6.06
Shipping Long Beach to Chicago	$13.40	$4.46	$8.94
Totals			
Per unit	$34.60	$17.35	$17.25
Per 100,000 units	$3.5M	$1.7M	$1.7M

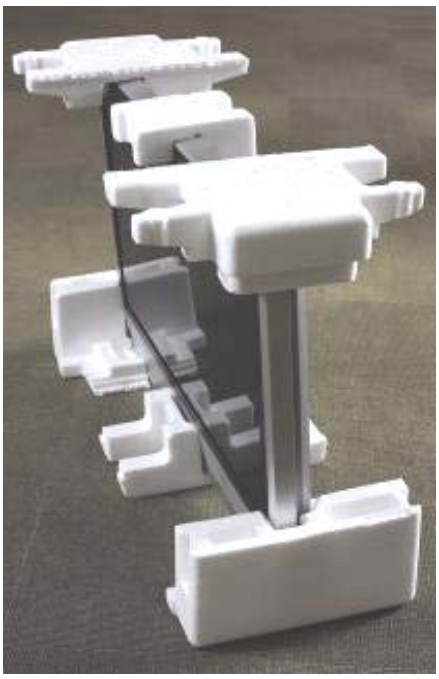
The cost comparison data shown here are the result of a model, and are provided for purposes of illustration only. Actual costs may vary.

Can you give us your opinions about the outlook for transportation costs? The above example is what we see happening in the current logistics environment – but I think it is worthwhile discussing the future of transportations costs. As you know, manufacturing has been and continues to move to Asia, and manufacturing and shipping products from Asia will remain an important consideration going into the future. The interesting thing is that container ports in Asia continue to grow to meet the growing supply need. However, container ports in the US are not growing fast enough to meet the growing demand need. So a supply and demand gap is starting to develop within the port infrastructure system. If this gap cannot be closed there could potentially be a large

problem with getting goods into the US through the existing port systems. This gap of course contributes to the rising cost of freight. Two things in particular contribute to the rising cost of freight.

- The first thing is port congestion. If you cannot move your products, you incur demurrage costs, port congestion surcharges, peak season surcharges and of course inventory carrying costs.
- The second thing is container availability. This is a big problem in Asia especially during the shipping peak season from April to October. Ocean carriers are forced to re-position empty equipment back to Asia to service the outbound supply chain. They are basically shipping empty containers back to Asia. To compensate for the zero revenue back-haul, carriers have no choice but to increase their freight rates on outbound shipments from Asia.

So I think the best way to reduce the exposure to port congestion charges and to reduce the exposure to the increasing cost of freight is to optimize load capacity. In other words, focusing on optimizing container loading and capacity will help minimize the impact of these costs, to maximize overall profitability. This is the core of the ARCEL story. We offer a tough, resilient foam that can help reduce damage and, more importantly, reduce our customers' supply chain costs.



Not considering logistics costs, how does the per unit material cost of using ARCEL foam resin compare to conventional foam packaging? The supply chain cost savings should be the primary consideration and I think the example above shows these savings. But generally you use less pounds of ARCEL than the traditional foams, which offset the higher cost of ARCEL. However, you need to really look at the total packaging cost, the combined cushion and corrugate costs. When you use ARCEL you can also create a smaller box, and a smaller box means lower corrugate costs. As a result, the total packaging costs of an ARCEL solution are usually less than a conventional foam solution.

Can you quantify any financial savings to TV brands in terms of reduced shipping damage or improved customer acceptance related to the use of the ARCEL packaging? Most brand owners will not release their damage figures because they do not wish to share their savings with us. Although the brand owners do not share these figures, we know we must be helping them save money because more and more brand owners are converting over to ARCEL. And as you know, no one uses a product, if it does not help them out somehow.

If the ARCEL foam resin is more durable and resilient than conventional foam, will this also enable less expensive corrugated outer packaging to be used? You can use less corrugate because the box is smaller, but you still need to protect the unit from the outside environment where there is no foam. So the quality of corrugate really depends on the package shipping environment.

Can you print directly onto the ARCEL foam resin? If so, do you foresee a day when the outer cardboard box might be eliminated altogether? This is a very interesting question. Yes, you can print on ARCEL. Other industries are doing something similar. The appliance industry is beginning to remove the outer corrugate and use what is called "clear view". Foam cushions are used on the top, bottom and corners and the unit is then wrapped in a polyethylene bag. The outer wrap can be printed with anything that the box could be printed with.

In today's TV supply chain, the LCD array is typically made in one location, module assembly is done in another location, and system integration in a third location. Is Nova Chemicals looking to reduce packaging/logistics costs between each of these steps? More importantly is there any work going on to enable packaging from one stage to be reused in the next stage of the supply chain? ARCEL can be used for final unit packaging and also for reusable packaging. Components can be shipped from the manufacturing location to the assembly location in reusable trays made from ARCEL. We have a history of using ARCEL in the

reusable packaging area in the automotive industry. The trays can actually outlast the life of some car models, up to five years. Also, reusable packaging not only reduces packaging costs, but reusable packaging is also better for the environment from a sustainability point of view.

Please provide us with some analysis that explains how ARCEL foam resin is environmentally friendly in the following four areas:

- **Reduced energy consumption in the production of packaging materials:** When compared to traditional foams, ARCEL parts will be smaller. A smaller part requires fewer raw materials and also the part can be molded into its final part using fewer utilities. When compared to other high performance foams, ARCEL also requires fewer utilities in the molding process, thus reducing energy consumption.
- **Reduced wastage of packaging materials:** Smaller cushion parts will lead to less corrugate. Overall there will be less packaging waste associated with the unit.
- **Reduced fuel consumption and emissions in the supply chain:** Let's go back to my simple example from earlier. A package with ARCEL fits 48 more units, as compared to the original package. In order to ship 1,440 units you would need six trailers with the traditional foam and only five trailers with the ARCEL solution. For every 1,440 units shipped you have removed one truck and trailer from the road, as well as the fuel consumption of that truck and its associated air emissions. Now expand that to the millions of TVs that are shipped annually and you have made a large environmental impact.
- **Use of fewer raw materials:** Any time that you can reduce the amount of packaging needed you are reducing the total amount of raw materials needed to make that packaging. Overall this will have a positive impact on the environment.

Does ARCEL foam resin have any limitations as compared to conventional foam materials? Thus far, we have not received any feedback about limitations of ARCEL in the TV industry.

Is special molding machinery needed? No, ARCEL resin can be molded in typical, conventional foam molding equipment.

Are there any limitations on the production volumes associated with ARCEL foam resin? No limits.

Where do you manufacture the resin? Both in Pittsburgh, Pennsylvania, USA and Ningbo, China.

It seems somewhat intuitive that many consumers will assume that a bigger box translates to better packaging. Have you done any study about consumer reaction to your packaging? No, we have not done any study on consumer reaction to our packaging. However, in today's eco-friendly culture, consumers are demanding less packaging, and we feel that ARCEL provides a unique opportunity for television manufacturers to meet that need to have sustainable packaging solutions.

Just out of curiosity, when foam cushions are shipped from the foam manufacturer, are there foam cushions used to protect the foam cushions? No, but interestingly enough you can use the same analysis as the earlier example. A smaller packaging part means more parts can be shipped from the cushion manufacturer to the assembly plant when compared to a larger part. This also leads to environmental savings.

Lastly, in addition to packaging materials, we note that ARCEL foam resin is used in recreational items like boogie boards. So, which is the tougher market – LCD TVs or boogie boards? The markets are very different, but both markets value ARCEL's material properties. The LCD market values ARCEL foam resin because its material properties allow the TV industry to reduce the size of their boxes thereby reducing their supply chain costs. The recreation market also values ARCEL's material properties because ARCEL's toughness, resiliency, and ease-of-use make it suitable for producing boogie, body, and surfboards. In one case you get to play with the end product, while in the other case, you get the entertainment of watching someone on a boogie board.

Commentary: Does 1024 = 1920?

by Alfred Poor

Alfred Poor is the editor and publisher of "HDTV Almanac", a free daily service of news and commentary on the HDTV, digital television, and home entertainment consumer electronics markets, at http://hdtvprofessor.com/HDTVAlmanac.

Plasma makers are making a big push back against the gains of LCD panels in HDTV applications, and they're pulling out all the stops. Buyers will have to look closely and read carefully to make sure that they get what they think they're getting. For example, consider the new "1080" plasma panels put forth by Hitachi, in models such as the P42H401 or P50H401. Hitachi promotes these as "HD1080 Plasma HDTVs". They have 1080 lines of native resolution (using an interlaced ALiS technology, but that's no problem). The problem is that they only have 1024 pixels per row. That's only 53% of the 1920 pixels defined in a 1080p or 1080i signal. Nearly half of the information in a 1080p gets thrown away, as a result. Half the detail of the image is lost.

Lost pixels are nothing new. We've been giving a pass to plasma panels with 1024 by 768 pixel resolution, letting them call themselves "720p" even though they don't have enough pixels to display the required 1280 pixels per line. And earlier this year, a federal judge formally decided that this practice was okay. But now we're talking about losing almost half the information on the screen.

Here's where the looking closely comes into play; can you see the difference between the detail on this display and a "real" 1080p display? Only you can answer that question, but I expect that anyone will see the difference when viewing an image that pans across closely spaced vertical detail, such as a pinstripe suit or the pickets of a picket fence. If you can't see the difference, then there's no reason not to get this "sort of" 1080 display. But I encourage you to look closely; these panels physically cannot display the detail that a panel with 1920 pixels per line can.

An image of the Brooklyn Bridge clearly shows what happens when there aren't enough pixels to form detailed images. The upper left image simulates a close-up of the bridge (from the upper left quadrant) as it would appear on a 1080p panel. The lower left image simulates a close-up of the same portion of the image, but on a 1024x1080 pixel panel, demonstrating the loss of detail.

2008 Display Industry Calendar of Events

A detailed calendar is maintained by Veritas et Visus: http://www.veritasetvisus.com/industry_calendar_2007.htm. Please notify mark@veritasetvisus.com to have your future events included in the listing.

January 2008			
January 6-9	Game Power and Mobile Entertainment	Las Vegas, Nevada	Digital Hollywood
January 7-10	2008 International CES	Las Vegas, Nevada	International CES
January 9-13	International Conference on Consumer Electronics	Las Vegas, Nevada	
January 11	LEDs in Displays	Costa Mesa, California	SIDLA
January 14-18	MacWorld Expo	San Francisco, California	Macworld Conference & Expo
January 15-16	Metalization and Dielectrics	Stratford-upon-Avon, England	
January 19-24	Photonics West 2008	San Jose, California	SPIE The International Society for Optical Engineering
January 21-24	Flexible Microelectronics and Displays Conference	Phoenix, Arizona	USDC
January 22-23	Projection Displays - Components and Systems	Edinburgh, Scotland	
January 22-24	ATEI 2008	London, England	ATEI
January 27-31	Electronic Imaging 2008	San Jose, California	Electronic Imaging
January 28-30	Stereoscopic Displays and Applications	San Jose, California	Stereoscopic Displays and Applications
January 29-31	Integrated Systems Europe 08	Amsterdam, Netherlands	infoComm
January 30-31	Japan Forum	Tokyo, Japan	DisplaySearch
January 30-31	Showcase of Emerging Display Technologies	Cambridge, England	
January 30 - February 1	Video Forum Europe	London, England	Videoforum
January 30 - February 1	Semicon Korea	Seoul, Korea	semi
February 2008			
February 5-6	Screen Expo Europe	London, England	screenexpo
February 7	Health and Safety of Whiteboards and Projection Displays	Reading, England	
February 7-9	CEA 2008 Winter Retreat	Park City, Utah	CEA
February 16-21	Medical Imaging	San Diego, California	SPIE The International Society for Optical Engineering

February 11-13	Strategies in Light Conference	Santa Clara, California	
February 12-15	Display Metrology Short Course	Boulder, Colorado	
February 13-14	Image Processing and Optical Technology	Birmingham, England	
February 15-17	Symposium on Interactive 3D Graphics and Games	Redwood City, California	
February 20-21	RFID Smart Labels	Boston, Massachusetts	
February 22-24	Sound & Vision 2008	Bristol, England	
February 24-27	Focus on Imaging	Birmingham, England	
February 27-28	Electronic Displays 2008	Nuremberg, Germany	
March 2008			
March 3-4	Business Goes Green	San Jose, California	
March 3-5	Global Phosphor Summit	San Diego, California	
March 3-6	O'Reilly Emerging Technology Conference	San Diego, California	
March 4-9	CeBIT 2008	Hanover, Germany	
March 5-6	LED China 2008	Guangzhou, China	
March 6	HD Expo	Beverly Hills, California	
March 8-9	Symposium on 3D User Interfaces	Reno, Nevada	
March 8-12	Virtual Reality 2008	Reno, Nevada	
March 10-13	Showest 2008	Las Vegas, Nevada	
March 11-13	FPD China	Shanghai, China	
March 11-13	Air Traffic Control	Amsterdam, Netherlands	
March 11-13	US FPD Conference	San Diego, California	
March 11-15	EHX	Orlando, Florida	
March 12-13	Media Summit	New York, New York	
March 13-14	Microdisplays, Applications, and Optics	Jena, Germany	
March 17-19	Digital Holography and Three-Dimensional Imaging	St. Petersburg, Florida	
March 18-19	Digital Living Room	San Francisco, California	
March 18-20	Semicon China	Shanghai, China	

March 18-20	electronica & ProductronicaChina 2008	Shanghai, China	
March 26-29	International Sign Expo	Orlando, Florida	
April 2008			
April 8-9	Printed Electronics Europe	Dresden, Germany	IDTechEx
April 11-17	NAB 2008	Las Vegas, Nevada	NAB
April 14-17	Hong Kong Electronics Fair Spring	Hong Kong, China	Hong Kong ELECTRONICS
April 14-18	EuroGraphics	Crete, Greece	EG
April 15	Mobile TV & Video Summit	Las Vegas, Nevada	iHollywoodForum
April 16	Broadband TV World	Las Vegas, Nevada	iHollywoodForum
April 16-18	FineTech Japan & Display 2008	Tokyo, Japan	FINETECH JAPAN
May 2008			
May 5-7	SEMICON Singapore	Singapore	semi
May 18-23	SID International Symposium	Los Angeles, California	SID
May 19-23	2008 Technology & Standards Forum	Nashville, Tennessee	CEA
May 20-22	CeBIT Australia	Sydney, Australia	CeBIT
May 25-27	International CES/Hometech	Dubai, UAE	CEA
May 28-30	3DTV Conference	Istanbul, Turkey	
June 2008			
June 3-7	Computex 2008	Taipei, Taiwan	
June 5	High Def Expo	Chicago, Illinois	HD
June 11-13	Display Taiwan 2008	Taipei, Taiwan	semi
June 11-13	Photonics Festival: OPTO Taiwan , SOLAR, LED Lighting, Optics	Taipei, Taiwan	PHOTONICS FESTIVAL 2007
June 14-20	InfoComm '08	Las Vegas, Nevada	infoComm
June 16-17	Projection Summit	Las Vegas, Nevada	Insight Media
June 16-19	International Conference on Organic Electronics	Eindhoven, Netherlands	ICOE
July 2008			
July 10-13	SINOCES	Qingdao, China	CES

July 15-17	Semicon West 2008	San Francisco, California	semi
August 2008			
August 11-16	SIGGRAPH 2008	Los Angeles, California	SIGGRAPH
August 29 - September 3	IFA 2008	Berlin, Germany	IFA
September 2008			
September 2-5	electronicIndia	Bangalore, India	
September 9-11	Semicon Taiwan, 2008	Taipei, Taiwan	semi
September 29 - October 1	LEDs 2008	San Diego, California	INTERTECH pira
October 2008			
October 7-9	SEMICON Europa 2008	Stuttgart, Germany	semi
October 7-12	CeBIT Bilisim EurAsia	Istanbul, Turkey	CeBIT
October 13-16	ElectronicAsia 2008	Hong Kong, China	electronicAsia
October 13-16	Showeast	Orlando, Florida	
October 15-19	CEA Industry Forum	Las Vegas, Nevada	CEA
October 27-30	CeBIT Asia	Shanghai, China	CeBIT
October 29-30	High Def Expo	Burbank, California	HD
November 2008			
November 4-7	EHX Fall 2008	Long Beach, California	EHX
November 8-10	Integrated Systems Russia	Moscow, Russia	infoComm
November 11-14	electronica	Munich, Germany	
November 19-21	InfoComm Asia	Hong Kong, China	infoComm
November 23-25	IDRC	Orlando, Florida	SID
December 2008			
December 3-5	SEMICON Japan	Tokyo, Japan	semi
December 10-13	SIGGRAPH Asia	Singapore	SIGGRAPH

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