

ELECTRONICS REPORT

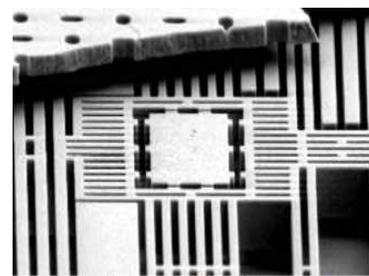
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ET TRENDS

BUSINESS & MARKET NEWS

ESC Regulations = MEMS - ESC, or Electronic Stability Control, must be included in all new vehicles sold in the United States by 2012. The new **crash prevention technology** keeps drivers from losing control on slippery roads, or in emergency situations, with the aid of automatic computer-controlled braking that can prevent deadly rollovers. Standardized electronic stability control is expected to save between around 5,000 to 10,000 lives annually and prevent between up to 238,000 injuries on U.S. roadways. The estimated average cost of electronic stability control is approximately **\$111 per vehicle**, assuming the model already has antilock brakes (ABS). But cost is \$479 per vehicle for the entire system if ABS is added. Automakers must begin to equip their vehicles with the technology in the 2009 model and must offer it as standard equipment by September 2011. The most common approach has been to use **MEMS** accelerometers or gyroscopes. When a driver swerves suddenly, sensors apply brakes to individual wheels to keep the vehicle from spinning out of control. Stability control is already standard on 90% of all new SUVs. But fewer than half of all other new cars come equipped with it. More than 10,000 people die in rollover deaths a year, even though only 3 percent of crashes involve rollovers. Automakers will need to comply with a 50 mph test involving a double-lane change. The requirement first was proposed last year, and the final regulations include a swifter phase-in plan. Stability control will be implemented beginning in the 2009 model year, when 55% of new vehicles will need to have it. By the 2011 model year, it will be in 95% of new vehicles.



MEMS Yaw Sensor - Bosch

Educational Toys - Some IC Assembly Required - The worldwide market for "edutainment toys" will reach \$7.3-billion by 2011 to become a driver for the semiconductor industry (In-Stat). The ever-expanding edutainment market typically applies new uses to existing technology that is found in mainstream consumer electronics products. Parents, grandparents and relatives have become more focused on enhancing children's educational experience through tech play. The latest primary research shows that 68% of respondents have heard of edutainment toys and 17% have purchased an edutainment toy for a child. *[Anyone who has bought for younger children should have noticed the fantastic array of products; some with substantial capabilities-KG]*



Flip-Chip Substrate Market and the Intel Factor - Although Intel's Core 2 Quad and AMD's upcoming quad-core processors could consume substantial flip-chip (FC) substrate, it's apparent that the industry-wide **overbuild** will need time to consume excess capacity. The new quad-core CPUs from Intel, and price adjustments, will create substantial **FC substrate demand** in the back-to-school season. When Intel adjusted the number of substrates from 12 to 8 for half of its dual-core chips during Q4-2006, it produced excess capacity of 20% at each FC production line. Quad-core CPUs are expected to penetrate



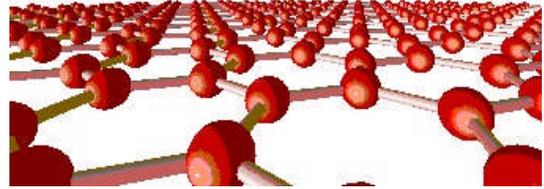
rapidly in the performance and mainstream PC segments over the coming two years, according to iSuppli. They estimate that quad-core CPU penetration in performance PCs (priced over \$1,000) will exceed 90% in the Q4-2009 while the rate will hit 49% in mainstream PCs (\$500-1,000) in the same period. Shipments of performance and mainstream PCs accounted for a total of 48% to total PC shipments in the Q1-2007. The low-end PCs (\$300-500) are not expected to make any use of quad-core technology over the next 2-years. But JP Morgan said that the FC substrate oversupply should persist through 2008. The oversupply ratio in 2007 and 2008 will be 10% and 15% respectively. CPU and Northbridge chipsets will maintain as the major demand drivers and account for over 50% of FC sales. Additionally, sharp demand growth should come from game consoles and digital TVs.

MATERIALS

Do-it-yourself Nanotech - First, it was carbon buckyballs, then carbon nanotubes (CNT), but maybe we need to take a step back and



unroll the CNT and reexamine

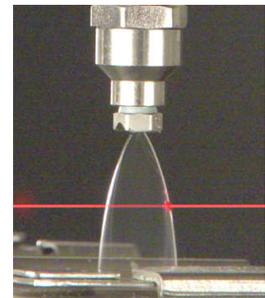


graphene sheets. University of Manchester has gone back to graphene research using one-atom-thick sheets. Graphene is the thinnest of all possible

materials and shares many of the properties of nanotubes, but it is easier to make and manipulate. Physicists have made transistors out of graphene and used it to explore odd quantum phenomena at room temperatures. Where can you get a sheet of graphene? Just unroll your own. Take a block of graphite and use Scotch tape to peel of a single layer since graphite is just a stack of graphene sheets. OK, now what? With this “breakthrough” discovery that anyone can make cheap graphene, we can expect to see a surge in graphene nanotech papers [*but not necessarily useful products; or am I being too critical? KG*].

EQUIPMENT

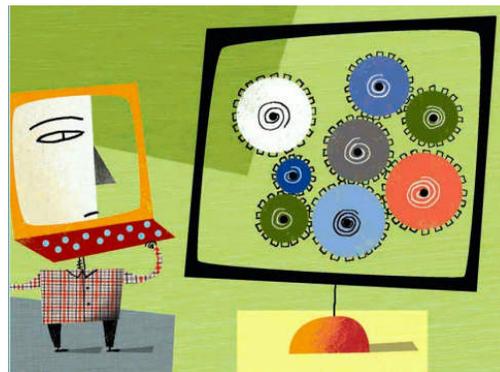
Asymtek (Nordson) is offering a *conformal coating and jet dispensing* workshop in May 2007 (and later); at the Doubletree Hotel in Orlando, FL. The workshop will focus on electronics assembly for military and industrial applications and will feature speakers from **Dymax**, **Henkel**, Humiseal, Lockheed Martin and **Asymtek**. Sessions will contain information on adhering to military specifications, applying conformal coating materials and chemistries, the "Tin Whisker" phenomenon and how to avoid its reliability risks, and non-contact fluid jetting technology for flip chip and chip-scale package underfill. The all-day workshop will feature live video demonstrations of conformal coating equipment and materials. No charge for the event.



- MIL Specifications / Process Capabilities / Solutions - Bernie McHugh
- Jetting Technology & Dispensing Equipment Overview - Steve Adamson
- Coating Materials / UV - Brian Toleno (Henkel)
- Coating Equipment & Application Techniques - Rick Zakrajsek,
- Conformal Coating Demonstration - Debbie Fazekas
- Tin Whiskers - Vijay Kumar (Lockheed Martin)
- Coating materials / Aqueous / Acrylics / Urethanes & Epoxies - Jerry Donahue (HumiSeal)
- UV Adhesives / Conformal Coating - John Kyger (Dymax)

TECHNOLOGY

While there haven't been any true breakthroughs in 2007, a surprisingly broad range of technologies continues to advance at paces ranging from steady to hectic. Telecom remains the strong driver as new products and systems are offered, but too many choices can also be an inhibitor. The CPU evolution is steady and somewhat predictable with multi-core architecture touted as the big "new" thing. TSV (Through Silicon Via) 3D chip stacking warrants watching (see Semiconductor Newsletter), and needs just a little more time. Organic electronics continues to move along and products will slowly emerge in the near future, but without causing disruptions. Organic memory is close to success, but incumbent silicon presents a substantial challenge in a super-competitive market. MEMS will make steady advancements and move a little faster, but don't expect anything spectacular this year, or even next. Energy technology is moving on many fronts, with solar getting most of the attention, but this field has been slowly evolving for many decades. If there is a breakthrough, it could come in the form of a low-cost non-silicon alternative, but the task is very challenging. Digital imaging, at the atomic scale, is back on the watch list, as IBM continues to innovate beyond the atomic force microscope to 3D. But the available building blocks of technology are certainly adequate to supply the need and desire for new products. All told, technology is adequately advancing, on so many fronts, that it will continue to drive economies in much of the world [KG].



IP

Licensing - Rohm and Haas and Eastman Kodak have entered into an agreement for Rohm and Haas to acquire Kodak's light patents and business that produces advanced films that improve the brightness and efficiency of LCDs. Rohm and Haas will acquire patent and trademarks, know-how, trade secrets, portfolio of current and future products, and a license to additional IP associated with Kodak's **light management films**. The acquisition also includes a pilot line in Rochester, New York. Rohm and Haas will build a dedicated, high-volume manufacturing facility in Asia with start-up planned for Q1-08. Kodak has developed a family of light management films used in a variety of applications. The first adaptation of this technology for the flat-panel industry uses millions of individual lenses randomly arranged on a polycarbonate film. One of several light management layers in a typical LCD application, this unique film improves brightness, color consistency, and viewing angle while reducing moiré, an optical abnormality common in commercial films.



TELECOM



China Telecom Use - China had 480.65-million subscribers of mobile communication services at the end of March 2007, growing by 17.32% per year (Ministry of Information Industry (MII)). That number of subscribers represented **35.3% of China's total population**. In Q1-2007, there were there 371.02 million subscribers of fixed telecommunication networks in China. Mobile phone subscribers

sent 48.52 billion short messages, averaging 3.28 short messages per phone number a day during March.

Intel - Expect to See WiMAX Digital Cameras by 2009 - Intel outlined its roadmap for the long-range wireless technology, which it claims will complement existing Wi-Fi and 3G services. Whereas Wi-Fi offers a range of only a few hundred meters, WiMAX goes out several miles away (up to 31). WiMAX cards that fit into a laptop's PC Card slot are already available from manufacturers such as Samsung, and Intel claims we will see WiMAX integrated into laptops in the next generation [Centrino chips], set for 2008. **Beyond 2008, expect integration into consumer electronics** devices, like games consoles, digital cameras and music players. The underlying

technology of WiMAX is so similar to Wi-Fi and Ultra-wideband and all three could be done on a single chip. Intel admits that those ambitious plans hinge on the widespread deployment of WiMAX by network providers. Although WiMAX offers a much greater range than Wi-Fi, Intel admits that it's vastly more problematic in urban areas. A WiMAX base station would only have a range of around 1-km in the centre of London, compared to roughly 10-km in rural areas; Intel is about to embark on a pilot scheme in the UK. The expense of erecting WiMAX masts could also prove prohibitive for companies other than the mobile networks, who could probably add the masts to their existing sites without extra planning permission.



 **The Global WiMAX Chipset Market** is set to reach 21-million units in 2011, growing from 0.3-million chipset units in 2006 (In-Stat). The growth is being driven by the emergence of mobile WiMAX applications. Vendors of ICs for **fixed WiMAX applications have redirected their efforts to mobile WiMAX** since about the middle of 2006. The majority of WiMAX chipsets produced in 2005-6 were 802.16d-compliant and aimed at fixed WiMAX. A small percentage of chipsets produced early in 2006 were used in early WiBro (mobile WiMAX) devices. Fujitsu, Intel, Sequans and Wavesat were the fixed WiMAX baseband market leaders but all have shifted focus to mobile WiMAX. Sierra Monolithics and Analog Devices have also announced mobile WiMAX chips. Intel has been working for years to build up the WiMAX vendor ecosystem and Sprint's announcement that it would build out a mobile WiMAX network was a huge boost for the movement overall, and has in turn put much pressure on mobile WiMAX solution vendors. Baseband vendors Beceem and Runcom are leaders in mobile WiMAX, and are powering some of the early WiBro devices. Other baseband vendors aiming at mobile WiMAX include Altair Semiconductor, Amicus, ApaceWave and Redpine Signals. RF IC providers who have jumped straight into the mobile WiMAX market include NXP, GCT Semiconductor and AsicAhead. *[While there is plenty of competition for longer-range wireless, I still pick WiMAX as one of the winners-KG].*

Fly Connected - Wi-Fi will soon be taking to American skies. Boeing had offered its *Connexion* Wi-Fi service in the past, but customers just didn't like its pricing; \$10 for 1-hour of access, \$15 for 2-hours and \$27 unlimited access. Boeing announced in August that it would discontinue the service and began offering customers free Wi-Fi access from October 2 until Connexion was finally shut down on December. It looks as though air travelers may once again have the option to use Wi-Fi aboard American airliners thanks to renewed



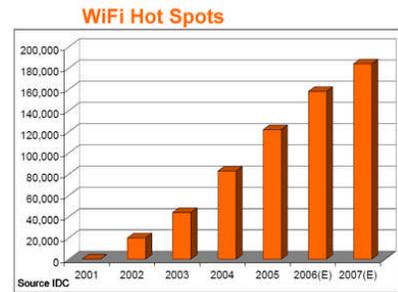
interest from airlines and communications providers. AirCell spent \$31 billion USD in 2006 for a portion of the radio spectrum for cell phone and Internet use. AirCell also notes that the equipment necessary for outfitting an existing airliner will only add 100 pounds and can be installed overnight by airline crews. The downside, however, is that equipment costs are likely to be around \$100,000 per plane. Luckily, for air passengers who choose to use AirCell's service, connection speeds and Wi-Fi performance will be similar to existing ground-based systems and discounts will be offered to customers of T-Mobile, iPass and Boingo services. AirCell is also trying to avoid the pricing problems that Boeing ran into with its Connexion service -- it will charge no more than \$10 per day to passengers for unlimited service. AirCell's Wi-Fi service will include Internet, email, VPN, SMS and IM access. The service will be available coast to coast and will offer DSL-like speeds and AirCell will provide email receipts for business expense usage. While Wi-Fi may be a viable option to air passengers in the near future, don't bet on using cell phones in the air anytime soon. Complaints from air passengers along with FCC regulations have so far kept that idea at bay. And for those of you thinking to use AirCell's Wi-Fi connection to make VoIP calls while in the air, guess again. The company says it will block VoIP services such as Skype through Wi-Fi connections. Boeing recently nixed its idea to provide wireless networking for its 787 Dreamliner. The wireless networking equipment that it planned to use would have added 200 pounds to the weight of the aircraft. The company instead decided to use wired networking which saves roughly 150 pounds. The company was also worried about regulatory issues when using wireless technology in certain countries.



WiMAX Asia/Pacific Subscribers to Exceed 31-million by 2012 - (DigiTimes) Total WiMAX subscribers in 16 Asia/Pacific countries are expected to hit 31.43 million by 2012, according to Research and Markets. Another 7.63-million users are expected to adopt the WiMAX-backhauled Wi-Fi network by 2012. The sum of subscription revenue collected by operators for both services will increase from \$438.9-million in 2006 to \$5.0920 billion in 2012. The year 2006 was notable for WiMAX. In the Asia/Pacific region, the South Korea version of mobile WiMAX-WiBro services-was commercialized in June. Although the subscriber growth was below expectation due to limited network coverage and lack of user devices, operators are working hard to grow their businesses after the initial difficulties. In other parts of the region, especially in emerging countries where the current household broadband penetration rates were extremely low, governments quickly built a pro-WiMAX regulatory framework. Operators also gained much confidence from the Sprint-Nextel decision to adopt WiMAX for their 4G network, and were actively conducting trials in hopes that WiMAX would lead to a lucrative wireless broadband business. In general, a solid foundation was laid by the joint efforts of market regulators, operators, and eager equipment vendors: prominent growth of the WiMAX market is highly possible in the Asia/Pacific region.

Worldwide Wi-Fi hotspots will grow by nearly 25% in 2007. While almost three-quarters of these sites (72%) are still found in North America and Europe, the Asia-Pacific region is growing very rapidly (ABI Research). Growth in China has been much slower than originally thought, but the Asia-Pacific region will come close to matching the number of North American hotspots by 2012. Europe remains the market leader with over 70,000 hotspots. One major driver of Wi-Fi hotspots is retail establishments. McDonalds is making rapid progress in turning its 4,000 locations into hotspots. The growing Wi-Fi hotspot market is fueling a demand for Wi-Fi access points. More than 900,000 access point units will be shipped this year for use in hotspots. Not only are hotspot

and subscriber numbers growing, but we have observed a dramatic increase in the number of Wi-Fi sessions per subscriber. This means that subscribers are connecting more often to check their e-mail and surf the Internet. Voice-over-Wi-Fi will become a very attractive choice for many major hotel chains, both for guests and for their staff. Boingo and Wayport are working with handset manufacturers to ensure that Wi-Fi-enabled phones will function at these two operators' hotspots even though they might not have the web browsers normally required for authentication.

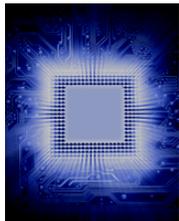


Wireless World Market - China and India will remain the world's growth market for wireless services and account for **60% of the 1.2 billion** predicted new mobile subscribers over the next 5-years (Global Insight). Predictions for the next 5-years: market penetration of wireless services will grow from 34.8% to 69.1% in China, and from 13.4% to 31.0% in India. China will outpace the other 19 markets in terms of broadband growth, accounting for more than one-third of the 350-million-plus new broadband subscriptions anticipated over the next five years. By 2011, China, with broadband revenues of more than \$19-billion and four times the subscribers, will surpass Japan as the world's second-largest broadband market. But the United States will continue to maintain its position as the world's largest mobile and broadband market by revenues over the forecast period. More than \$50-billion in revenues will be lost worldwide over the forecast period due to fixed-line subscriber declines and the migration of voice traffic to mobile and VoIP networks. A 4.5% decline is predicted in traditional fixed-line accesses as the growth in the China and India markets fail to offset the erosion of traditional accesses in markets like Japan, South Korea, and Europe. Fixed-line share of total telecoms revenues will fall from 39% in 2006 to 21% in 2011, while by the end of 2011, mobile will account for over two-thirds of total telecoms revenues in those markets.



INTERNATIONAL NEWS

Chips Down for India - Texas Instruments has ruled **out building a chip fab in India** despite the country's new incentives for high-tech investments. TI's investment focus in India will remain on research and product development only. TI may sub-contract work to chip foundries that may set up in India, but will not consider the country as a manufacturing location. The government in India recently unveiled a new fab policy designed to attract investments for setting up semiconductor fabrication and other micro and nano technology manufacturing industries. Under the policy's terms for wafer fab products, the threshold net present value (NPV) of investments would be \$566.2 million. The threshold NPV of investments in manufacture of other products would be \$226.5 million. The policy also indicated that if a fab is located in a designated special economic zone (SEZ), the incentive would be a direct investment from the government of 20% of the company's capital expenditures within its first 10 years of operation. For a unit located outside a SEZ, the incentive would be a 25% investment of the capital expenditures within its first 10 years.



Chips Up for India - Infineon has signed a memorandum of understanding with the Hindustan Semiconductor to help create a 'Fab City' in India and the building of ten fabs. Others involved in the huge project are Siemens, MW Zander, and US Liquids. Infineon's contribution will be the provision of process



technology, chip design capabilities and expertise in setting up new fabs. "Fab City will have everything in terms of infrastructure, power, water and chemicals which the semiconductor industry needs. The first fab Infineon will help build will be a 200-mm 130-nm facility costing about \$800 million to be running by 2009. The second fab will be a 300-mm 90-nm facility. The other eight fabs will be announced by 2010. The Indian government recently revealed a support scheme for semiconductor manufacturing under which the government pays up to 20% of a project cost through equity participation, tax breaks or other financial incentives. The reason why the Indian government is so keen on the semiconductor industry is because it expects sales of electronic goods to increase by ten times in the next ten years, reaching \$363-billion by 2015. (Electronics Weekly)



Vietnam Electronics - Intel started construction of a chipset assembly and test facility with total investment of \$1-billion in southern Ho Chi Minh City, the first of its kind in Vietnam. When completed in mid-2009, the facility will be the seventh assembly site of Intel's global network, and is projected to eventually employ some 4,000 local people, and generate annual revenues of \$5-billion. Assembly and test facilities package chips that come from semiconductor fabrication plants. The assembly and test process can be broken down into three stages: packaging, testing and shipping. Vietnam is promoting high technologies, including information technology, in a move to realize the target of becoming an industrial country by 2020. Vietnam plans to have 38 million phone subscribers by the end of this year, or 43 units per 100 residents, up from 27.5 million subscribers by the end of last year. It also eyes 6 million Internet subscribers, by late 2007, up from over 4 million by late 2006. Vietnam earned nearly \$1.8-billion from exporting electronics goods, including computers, mainly to Japan and Southeast Asian countries, in 2006, up 24% from 2006.

India High-Tech Industry Almost Out of Workers? - Nearly two decades into India's phenomenal growth as a center for high technology, they are running out of workers. While Indian schools graduate 400,000 new engineers per year, only 100,000 are actually ready to join the job world, experts say. Some universities that are mired in theory classes, and sometimes so poorly funded that they don't have computer labs. Even students from the best colleges can be dulled by cram schools and left without the most basic communication skills, according to industry leaders. The problem is a shortage of trained people. The incorrect outside view of India with over 1-billion and a large percent who are English-speaking, is a bottomless supply of cheap workers with enough education to claim outsourced Western jobs. But things look far different in India, where technology companies are spending hundreds of millions of dollars in a frantic attempt to ensure their profit-making machine keeps producing. This is the Achilles heel of Indian industry. In 2000, there were maybe 50,000 jobs and 500,000 applicants, but now there are perhaps 180,000 annual openings, but only between 100,000 and 200,000 qualified candidates. Industry is barely keeping up. The National Association of Software Services Companies (NASSCOM) estimates a potential shortfall of 500,000 technology professionals by 2010. On the most basic level, it's a problem of success. The high-tech industry is expanding so fast that the population can't keep up with the demand for high-end workers. A shortage means higher wages. But much of India's success has been that software programmers work for about 25% of the salary as Western workers. The responses range from private "tech finishing schools" to multimillion-dollar partnerships spanning business, government and higher education. The biggest companies have built elaborate training centers.

