ELECTROFORM VS. LASER-CUT STENCILS

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If you don’t already have one, search for a QR code reader app in your smartphone’s app marketplace. Then use it to scan the code above & download this magazine issue right to your phone.
Global Summit for Advanced Manufacturing

By the time this issue reaches your desk, we are likely to be 4-6 weeks away from SEMICON West in San Francisco.

This year the event is going to run alongside a new Global Summit for Advanced Manufacturing. The summit is the brainchild of a group of manufacturing engineers from Jabil, Flextronics, Alent, and others. The aim is to create an interactive forum for networking and the open discussion of real manufacturing issues and supply chain concerns.

Unlike many other conferences in this area, the focus will not be on technology-related presentations but instead more practical concerns like sourcing components and labor on a global basis, dealing with miniaturization issues, lessons learned when implementing new technologies into different manufacturing environments etc.

The discussions are likely to venture into other industries, such as textiles and wearable electronics, building and construction for smart homes, and other disruptive technologies that cross into industries that currently have little or no experience of electronics.

On day three, the event plans to conduct tours of local manufacturing facilities in the area, including Flextronics and Applied Materials.

The inaugural event will be held July 9-11th in the Marriott Hotel adjacent to SEMICON West. I look forward to meeting some of you there and discussing some of your manufacturing concerns and how Global SMT & Packaging can assist you in addressing these issues and share them with a wider manufacturing audience.

Visit www.gsam.org to find out more about this new association and the full conference program.

—Trevor Galbraith, Editor-in-Chief editor@globalsmt.net
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Component selection for SAFE designs

Solderless assembly for electronics (SAFE) offers the designer potential to make significant improvements in the cost, performance, reliability, and environmental friendliness of their circuit design. The reasons for this are many, but they all stem from one fundamental feature of the approach, and that is the idea’s basic simplicity. In that regard, the guiding principle of SAFE was long ago suggested by William of Occam who, in the 13th century, rightly suggested that “Things should not be multiplied unnecessarily,” or as it has also been translated in more poetic form, “It is vanity to do with more that which can be done with less.” The elimination of solder is the key in the present argument that the designer’s product can be improved by following his simple but profound advice.

With that said, it is both important and worth noting up front that most electronics fail at or near a solder joint. According to a major supplier of conformal coating materials, up to 25% of failures are related to dendrite shorts between adjacent terminations and often associated with solder. Many, if not most, of the other failures of electronics can often be traced directly to solder joints. This is something long known to reliability engineers. It is no secret that solder technology is the weak link in the chain of elements which define the limits of electronic assembly reliability. Yet the industry continues to embrace solder as a preferred method for making electronic interconnections. The reasons are rooted in the industry’s familiarity with soldering processes and its sunk investment in this long-standing manufacturing approach. Why else would the electronics industry spend so much time and effort to improve the soldering process and detect its weaknesses and failures? It has been estimated that somewhere between 50 and 100 billion dollars have been spent in the needless pursuit of lead-free solder implementation.

It is sad, but it also should give rise to a certain amount of resentment at the waste. Trusting that the reader/designer has not taken umbrage at this assertion of fact and is ready to move towards the resolution of the fundamental problem by eliminating solder from the manufacture of his or her product, it is possible to explore some of the possibilities for SAFE product design.

One of the first things that comes to mind for many designers is: “How is it possible to use this technique with so many different component types out there?” It is a fair question, and as was suggested last month it can be tackled with some forethought, planning, and coordination with component vendors. In advance of discussing the details, however, it is worth a moment to address the challenge presented by legacy components, which include both through hole mounted devices, such as coaxially leaded resistors and capacitors, DIPs, SIPs, and PGAs, as well as SMT devices represented by a much wider range of component types, which include SOPs, TSOPs, QFPs, BGAs, LGAs, and QFNs, along with various discrete chip resistors, capacitors and SOTs. At the present time, the number of options in terms of format for electronic components is mind-boggling. When all the various lead pitches and lead counts and component heights are factored in, they number in the thousands. Today, the many types of packaged devices collectively create a cacophony of options that is difficult to sort through, largely because no legacy component type ever seems to leave the list of options. Through
Component selection for SAFE designs

hole leaded components continue to be manufactured even though they are more expensive and take up much more space than their surface mounted counterparts. It should also be noted here, however, that all of these legacy can be adapted to SAFE manufacturing methods; however, they are not optimally suited. There is a better way, and that involves thoughtfulness and planning.

In short, the ideal components for a SAFE assembly have three common features: they should ideally be leafless (think QFN and LGA), they should have a common height, and they should have a common base lead pitch. A fourth feature that might well be included is that they have no need for specialized solderability protective coatings or lead finish. In fact, copper is actually ideal.

What has been offered up is a simple prescription, and it is worthwhile to offer up a simple comparison for visualization to cement the concept. To do that, one can simply think of the internationally popular construction toy LEGO. The two concepts work under a nearly identical principle: providing an underlying order that makes construction simple. What this does for the designer is allow the components to be laid out in a manner where all of their terminations reside on a common grid. This offers tremendous advantages when it comes to circuit routing because the routes are more predictable. If one uses a mix of many different component lead types and lead pitches as is common today, the routing is much more complex, and design rule checks are constantly having to be evaluated for spacing violations, noise, and signal integrity issues. Moreover, because the component pads are being accessed through a dielectric, the number of routing channels between pads can often be at least doubled, reducing the number of layers in the design, as illustrated in the accompanying graphic. A good base pitch to consider is 0.5 mm because there have been a lot of devices adapted to this pitch, which turns out to be a wall of sorts for traditional soldering, as below this pitch soldering yields generally fall off pretty rapidly. If need be, the designer can use other components which have pitches that can be derived therefrom. For example, a depopulated 0.5 mm device can yield 0.707 mm, 1.0 mm and 1.414 mm. The same holds true in the selection of discrete devices. It may well be that the designer will not be able to get all of the components they want under this prescription, but if enough designers begin to ask for such requirements, it is likely that some electronic device suppliers will answer the call. Obviously is will be less expensive for them to manufacture components that do not require a solder ball or a special finish, and their manufacturing yields would most certainly improve.

While the considerations briefly discussed here are foundational in the design of SAFE products, there are many other “layers to the onion” that offer even more potential benefit and freedom to the designer. These will be “peeled back” and discussed in future columns.

Verdant Electronics founder and president Joseph (Joe) Fjelstad has more than 40 years of international experience in electronic interconnection and packaging technology in a variety of capacities from chemist to process engineer and from international consultant to CEO. Mr. Fjelstad is also a well known author writing on the subject of electronic interconnection technologies. Prior to founding Verdant, Mr. Fjelstad co-founded SiliconPipe a leader in the development of high speed interconnection technologies. He was also formerly with Tessera Technologies, a global leader in chip-scale packaging, where he was appointed to the first corporate fellowship for his innovations. He has 150 US patents to his credit.
Murray Percival Company is now a leading supplier to the Midwest’s electronics industry and offers literally thousands of products. www.murraypercival.com, www.mirtec.com

Renowned reliability expert joins DfR Solutions

DfR Solutions appointed Dock Brown to its Senior Technical team. Brown will support clients across the electronics industry with a specific focus in the aerospace, aviation, and medical device markets. Prior to joining DfR Solutions, Brown spent nearly 20 years at Medtronic, where he most recently concentrated on the transition to RoHS materials and processes of harsh environment Class III medical devices. He is based in the Seattle area and will be supporting DfR Solutions customers in the Pacific Northwest. www.dfrsolutions.com

Nordson ASYMTEK president, Peter Bierhuis, selected to join the IPC SMEMA Council

Nordson ASYMTEK announces that Pieter Bierhuis, president of Nordson ASYMTEK, has been invited to join the IPC Surface Mount Equipment Manufacturers Association Council (SMEMA). The Council furthers the competitive excellence and financial success of suppliers to the electronics assembly industry. www.nordsonasymtek.com

Interphase manufacturing facility showcases Juki SMT equipment

Interphase Corporation has greatly expanded production capacity at its new corporate and manufacturing facility with a full line of Juki SMT production equipment. This is the third time that Interphase has selected Juki equipment for its turnkey concept-to-production capability. Over the past 35 years, Interphase has fulfilled the outsourced electronics board design and manufacture, as well as subsystems, systems, and full-service manufacturing needs of the most demanding customers. www.iphasen.com, www.jukiamericas.com

ACE receives order for KISS-102 from Precision Technology Inc.

Precision Technology Inc. has purchased a KISS-102 selective soldering system from ACE Production Technologies, Inc. The new KISS-102 selective soldering system will be installed at the Precision Technology Inc. manufacturing facility located in Plano, Texas and is the second selective soldering machine Precision Technology has ordered from ACE Production Technologies. Precision Technology Incorporated is a world-class electronic design and manufacturing firm offering quick-turn prototype and high-volume manufacturing services. Their complete range of services includes design engineering and prototyping, printed circuit board and wire harness assembly, box builds, electromechanical assembly, and complete testing and inspection. www.ace-protech.com

Industry Handbook written with BTU reflow expertise

BTU International’s Fred Dimock, manager of process technology, contributed to the new handbook published by the Surface Mount Technology Association (SMTA). The book, “Handbook of Electronic Assembly and a Guide to SMTA Certification,” originally was conceived as a supplement to the SMTA Certification Program and provides an in-depth understanding of the entire electronic assembly process with a special focus on helping those new to the industry develop competence in the technology. www.btu.com

Metal presents Z Tech Services with “Rep Firm of the Year” Award

Z Tech Metcal presented Z-Tech Services Inc., its manufacturers’ representative in the Chicago area, with its “Representative Firm
Saline's customers that utilize TTC will cycle of a product through manufacturing. Control (TTC) system. The system fur-}

Saline’s customers that utilize TTC will have access to real-time data of work-in-process, verification of quality processes and production flow as well as a thorough history of the assembly process in case of a recall. www.lectronics.net

**STI Electronics, Inc. receives IPC Stan Plzak Corporate Recognition Award**

IPC – Association Connecting Electronics Industries® presented STI Electronics with the IPC Stan Plzak Corporate Recognition Award. Named after a former IPC Board Chairman who was a founding member of the Electronics Manufacturing Services Industry Management Council, the Stan Plzak Award recognizes an IPC member company in the electronics assembly industry that has taken the initiative to actively contribute to enhancing the industry while demonstrating support of IPC though participation in technical and/or management programs. Nearly all of STI’s staff are active with IPC, with six employees actively engaged in dozens of standards development committees. Additionally, the company has several IPC specialists in its CM and Engineering Division as well as a multitude of certified trainers. www.stielectronicsinc.com

LEONI expands use of Mentor Graphics Capital software worldwide

Mentor Graphics Corp. announced that LEONI is expanding its use of Capital® software throughout the world. LEONI now has significant Capital software deployments in Europe, America and Pacific Rim. This growth is driven in part by increasing adoption of the modular approach to wire harness configuration management, also known as customer-specific or zero give-away harnessing. This approach is strongly supported by the Mentor® Capital ModularXC™ tool, which in turn is tightly linked with other products in the Capital suite and with adjacent applications such as mechanical CAD applications. www.mentor.com

**Manfred Maehl, President of SMT North America to retire**

Manfred Maehl, President of SMT North America, Inc., will retire effective April 30, 2014. In April 2008, Mr. Maehl established and took over operation of the SMT subsidiary, an assignment especially suited for him due to his long experience in the international capital equipment market, starting in Germany and followed by challenging assignments in different European countries and in the United States. Since 1991, Mr. Maehl worked successfully in various executive positions in the electronic industry, predominantly for German/American companies manufacturing soldering equipment.

**Boston Semi Equipment purchases test handler assets of Aetrium, Inc.**

Boston Semi Equipment LLC (BSE) announced that it has completed the purchase of the test handler assets of Aetrium, Inc. Aetrium’s products and served markets are complementary to BSE’s current automated test equipment (ATE) product lines, as gravity test handlers are used in conjunction with a significant percentage of all semiconductor ATE systems. www.bostonsemiequipment.com

**Fine Line Stencil implements online ordering system for stencils**

FCT Assembly announces that Fine Line Stencil has implemented a new online ordering system for stencils. Customers now can order laser-cut SMT stencils quickly and securely. Fine Line Stencil’s new online ordering system automates the stencil order entry process. Users experience a 20 percent reduction in order process time, ensuring on time delivery. The system eliminates processing errors by removing redundant process steps. Additionally, it eliminates printing, making the process even more environmentally friendly. www.fctassembly.com

**Krayden named distributor of the year for Electronics in 2013 North America**

Dow Corning has named Krayden, Inc., as the recipient of the “Dow Corning Electronics North American Distributor
of the Year 2013” for its outstanding performance in the distribution of engineered silicone materials in electronics. Krayden has been honored with this coveted and prestigious award five out of the last seven years. The North American Distributor of the Year Award is an acknowledgement of the top performance amongst other category distributors, and the criteria for selection includes promotion of new products, identification and development of customer solutions. www.krayden.com

Digicom Electronics awarded ITAR Certification
Digicom Electronics, Inc., announces that it has received International Traffic in Arms Regulations (ITAR) certification. ITAR is a set of United States government regulations that control the export and import of defense-related articles and services on the United States munitions list. This certification enables Digicom to manufacture products and take on projects that are marked to be under ITAR control. www.digicom.org

Techspray introduces new 2014 Product Catalog & Application Guide
Techspray has released their 2014 Product Catalog and Application Guide. Techspray’s 2014 catalog includes high precision cleaners, conformal coatings, and rework, repair and cleaning supplies. Improved look-up tables offer more product and application specifications to guide the product selection and qualification process. Breakthrough new products detailed in the catalog include XT-Armor Oven Shield, Eco-dFluxer SMT200 and SMT300 inline and batch defluxers, and Fine-L-Kote High Viscosity AR conformal coating. www.techspray.com

Vi TECHNOLOGY appoints Jean-Marc Peallat as global sales VP
Vi TECHNOLOGY is pleased to announce the promotion of Jean-Marc Peallat to the position of Global Sales VP. François Amblard, CEO of Vi TECHNOLOGY, has appointed Jean-Marc Peallat to manage all sales activities worldwide. Jean-Marc Peallat owns a PhD in mechanical engineering from the National Polytechnic Institute of Grenoble and a MBA from the business school IAE Grenoble. He joined the company 16 years ago and held numerous positions in Applications, Marketing and Sales. Jean-Marc Peallat will take on his new role in addition to his existing position as CEO of VIT Americas. www.vitechnology.com

Deca Technologies ships 100-Millionth wafer-level packaged component
Deca Technologies announced that it has shipped its 100-millionth component. The company attributes this milestone to strong demand from portable electronics manufacturers for wafer-level chip scale packages (WLCSP) manufactured using Deca’s unique, integrated Autoline production platform, which is designed to achieve faster time-to-market at lower cost. www.decatechnologies.com

Aeroflex and ATG announce strategic alliance
Aeroflex Incorporated and Advanced Technical Group Company (ATG) have entered into a long term strategic alliance agreement. The initial focus of the alliance will be to integrate ATG’s modern software-driven digital modulation technology into the Aeroflex transponder and Traffic Collision Avoidance System (TCAS) test equipment product lines. These test solutions will support testing requirements driven by the FAA’s NextGen Airspace Transformation mandate. www.aeroflex.com

Inovaxe Executes service agreement for all of California
Inovaxe announces the appointment of Advanced Precision Sales & Distribution as its new manufacturers’ representative for all of California. APS Industries, in partnership with Advanced Precision Distribution, offers in-depth solutions to today’s complex manufacturing challenges. As a representative of some of the most highly respected and innovative companies in the industry, APS provides best-in-class equipment along with technical knowledge. www.APSIndustries.com, www.inovaxe.com

ACD expands box build capacity
ACD has increased its workforce and expanded its mechanical assembly division to meet increased demand. ACD’s assembly operation is focused on customers by providing a single source from new product development through price conscious board, box or system level production. The company’s standard cycle time for assembly is five days, but can be expedited to as quick as same day manufacturing when needed. www.ACDUSA.com

Libra Industries appoints director of product realization
Libra Industries announces that it has appointed Gerry Waldron to the position of Director of Product Realization, effective immediately. Waldron will function as the external customer interface for new product introductions and the project lead for onboarding new customers. As Libra Industries’ Director of Product Realization, he will ensure that the onboarding execution is conducted in a world-class manner to meet and exceed customer expectations while building long-term relationships that support Libra Industries’ profitable growth objectives. www.libraind.com

Pro Mach tags Alan Shipman to replace retiring identification & tracking president Bob Zuilhof
Pro Mach, Inc. announced that Alan Shipman has been named President of its Identification & Tracking Group to replace Bob Zuilhof, who is retiring in June. Through its ID Technology and Labeling Systems (LSI) brands, Pro Mach’s Identification & Tracking Group designs and manufactures labeling, coding, and marking systems, peripherals, and labels for a wide range of industries and custom applications. The Identification & Tracking Group employs over 275 people across seven manufacturing facilities and dozens of regional support locations throughout North America. www.ProMachInc.com
MIRTEC Europe strengthens its presence in Southeast Europe

MIRTEC announces that it has appointed ALFA TEST SRL as its newest manufacturers’ representative. The company will represent MIRTEC Europe’s leading-edge AOI technologies throughout Romania, Bulgaria, Serbia, Croatia, Slovenia, Macedonia, Bosnia and Herzegovina. With 10 years of AOI expertise and local sales and application engineers, ALFA Test strong competitive advantages for increasing MIRTEC’s market share in this region. Having two offices, with the headquarters in Romania and a new office in Bulgaria, the company is able to well support its customers from Romania, Bulgaria, Croatia, Slovenia, Serbia and Macedonia. www.alfatest.ro, www.mirtec.com

Swiftmode expands sales network in Europe

Swiftmode has during the last 12 months built a strong dealer network in Europe to market the product Hyperclean. Hyperclean is an SMT printer stencil cleaning roll based on a 100% polypropylene fabric, developed and manufactured by Swiftmode. Hyperclean is available for most makes of SMT screen printers and has been received well in the market. Several leading CEM and OEM electronic production sites has evaluated the product and decided to convert to Hyperclean. Therefore, Swiftmode needed a strong local presence in the form of established dealers with the right knowledge and relationships on their markets. www.swiftmode.com

ESCASTECE installs PCB router

ESCASTECE has installed an Elite EM-5700N PCB Separator. This milling machine enables PCBs to be automatically separated from each other after production. The camera vision system provides a cutting accuracy of 100 microns providing customers with a very high quality of PCB finish. www.escatec.com

Storagesolutions partners with Juki Japan

Matteo Padoan, ESSEGI SYSTEM SERVICE Storagesolutions, announced that it has signed an agreement with Juki Automation Systems Corporation. Under the agreement, Juki will distribute Storagesolutions’ intelligent storage systems throughout Japan and other countries in Asia. www.juki.co.jp, www.storagesolutions.it

Storagesolutions appoints sales partner in Russia

Storagesolutions announces the appointment of CJSC Ostec-SMT as its sales partner for the Russian market. Ostec will represent Storagesolutions’ complete line of ACS automatic and intelligent component storage systems throughout the Russian Federation, Ukraine, Belarus, Kazakhstan and Moldova. www.ostec-smt.ru, www.storagesolutions.it

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Teknek celebrates 20,000th clean machine

Teknek is celebrating the production of its 20,000th clean machine. The CM8 clean machine is part of a consignment destined for China. Ruaridh Nicolson, Teknek’s sales and marketing manager, said, “Since we invented contact cleaning in 1984 we have remained at the forefront of our sector through constant improvement and innovation. We have also seen the number of sectors where our technology can help improve yields, quality and efficiency explode from electronics into converting, printing, glass production, solar panels and Flat Panel Displays.” www.teknek.com

GOEPEL electronic pushes cooperation network forward to Sweden

GOEPEL electronic and the Swedish company AddQ Consulting announce a partnership as part of the GATE program (GOEPEL Associated Technical Experts). The company based in Stockholm and Gothenburg is a leading provider of high-value-added Test and Measurement Solutions and offers training in the field of test and measurement systems and quality management. www.goepel.com

TRI signs strategic partnership with GRUPO EIIT

Test Research, Inc. (TRI) proudly announces a new partnership with Europe’s premier manufacturer of test handling equipment, GRUPO EIIT. The deal will allow EIIT to distribute TRI’s products in Spain and Portugal, as well as integrate TRI’s proven MDA and ICT instrumentation with EIIT’s Offline and In-Line test handlers. www.tri.com.tw
Print performance studies comparing electroform and laser-cut stencils

Rachel Miller Short and William E. Coleman Ph.D., Photo Stencil, and Joseph Perault, Parmi

This study investigates and compares the print performance in terms of % paste transfer as well the dispersion in paste transfer volume for a variety of electroform and laser-cut stencils, with and without post processing treatments. Sidewall quality will also be investigated in detail. A Jabil solder paste qualification test board will be used as the PCB test vehicle. This board has a wide range of pads ranging from 75 micron (3 mil) squares and circles up to 300 micron (12 mil) squares and circles. There are also long rectangular pads with spacings as low as 75 micron (3 mil). A total of 12 stencils, four stencils of different stencil technologies with three different coating configurations, will be tested as described in 1-4 below, each one without nano coat and with nano coat A and nano coat B:

- Electroform (E-FAB)
- Laser-cut electroform foil (NiCut)
- Laser-cut SS (Laser FG)
- Laser-cut SS with electropolish and nickel plating (NicAlloy)

A 100 micron (4 mil) thick stencil is used for all 12 stencils yielding area ratios ranging from .31 to .121.

SMT assembly is faced with a common challenge. As components get smaller and smaller, it is difficult to print solder paste to satisfy the requirements of both very small components, such as .4 and .3mm pitch CSP, as well as normal SMT components.

On the one hand, the large components require more solder paste volume for sufficient solder fillets after reflow. If this same stencil normally used to print solder paste for SMT components is used to print solder paste for the small components, the apertures are so small that poor paste release is encountered. The print process can be divided into two processes: the aperture fill process and the paste transfer process. Both the large and small apertures have good paste fill. The large apertures have good paste transfer, but the small apertures do not. The result is good solder paste volume, resulting in a good solder joint after reflow for the large apertures, but insufficient paste volume for the small apertures due to poor transfer, resulting in dry solder joints.

As an alternative, a thinner stencil could be used, resulting in good paste fill and good paste transfer for both small...
Print performance studies comparing electroform and laser-cut stencils

and large apertures. However, this results in insufficient solder paste volume for the large aperture, resulting in a poor fillet and lean solder joint.

On the other hand, there is sufficient solder paste volume for the small components to form good fillets and good solder joints after reflow.

The area ratio plays a large part in this dilemma. The paste transfer process can be considered as a tug of war. The area under the stencil aperture is trying to pull the solder paste out of the aperture, but the aperture walls are trying to hold the paste inside the aperture. The more wall area compared to the area under the aperture, the more difficult it is for the paste to be pulled free from the walls.

The area ratio is defined as the area of the aperture walls divided by the area beneath the aperture opening. The acceptable area ratio for >80% paste transfer and <10% paste volume standard deviation is typically .5 for stencils with smooth aperture walls. Typically for 01005 and .3mm CSP components the stencil thickness would need to be 62 µm (2.5 mils) to achieve acceptable paste transfer. This is typically too thin a stencil for normal SMT devices. Typically a stencil of at least 100 µm (4 mils) is required for boards having normal SMT components. If 01005 or .3 mm CSP components are populated on a SMT board with normal SMT components a 100 µm (4 mil) thick stencil would need to provide acceptable paste transfer at area ratios of .38-.44.

There have been several technical publications dealing with optimization of the miniature component solder paste printing process1-7. The purpose of this study is to investigate four different stencil technologies in conjunction with three different post process coating technologies to determine if a 100 µm (4 mil) thick stencil can provide acceptable print performance for area ratios in the range of .38.

Scope of the study

Each or the 12 stencils’ performance was evaluated in five separate categories listed below:

Print Performance in terms of % paste transfer and the dispersion in paste transfer volume function of area ratio. The >80% paste transfer and <10% paste standard deviation will be utilized to define the lowest area ratio for all 12 stencils.

Stencil Side Wall Quality: Pictures of a 5 mil (125 micron) square aperture at 700 magnification for all 12 stencils will be compared.

Paste Volume change from 1st print to 10th print without wiping the stencil.
Print performance studies comparing electroform and laser-cut stencils

Paste Smear between solder bricks after 10 prints without wiping the stencil.

Paste Smear on bottom of stencil after 10 prints without wiping the stencil.

Print set-up
The test board selected is Jabil test board manufactured by Practical Components, part number 12855. This test board is used in both stencil and paste evaluations. This board has both mask-defined and copper-defined pads. Circular and square pads range from 75 µm (3 mil) up to 300 µm (12 mil). Rectangle pads range from 75 µm (3 mil) up to 300 µm (12 mil) wide by 1.27 mm (50 mil) long. This study evaluated stencil apertures and pads starting at 125 µm (5 mil) with nominal area ratio for circles and squares of .31, and .57 for rectangles. This board also contains 200 µm (8 mil) and 150 µm (6 mil) pads with spacings equal the pad width. This configuration was useful in evaluating paste spread between solder bricks.

Stencil printer was Speedline Momentum with the following setup:
• 38.1mm/sec print speed
• 7kg pressure
• Blade width 12”
• Separation speed 80mm/sec
• Wipe each board for run or 10 boards
• Run of 10 boards w/o wipe
• Solder paste Indium 8.9HF Type 4.

The SPI was a Parmi HS70:
• Bare Board Teach was completed to accurately measure the paste deposits from the actual pad surface.
• The primary algorithm parameters are
  • Pad Offset = ? means that the actual pad height varies from pad to pad across the board and this screenshot shows the settings for ALL the pads on the board.
  • Paste Measuring threshold = 35µm
  • Dual Threshold (Pad Threshold) setting= 10µm
• Those two thresholds are used in conjunction with each other to yield more accurate measurements for very small deposits.

The print sequence was as follows:
• 10 boards were printed and the stencil was wiped after each print.
• SPI was collected for all 10 boards.

Paste volume data was captured for the following board locations:
• 125 µm (5 mil)–300 µm (12 mil) copper-defined circular pads (CD)
• 125 µm (5 mil)–300 µm (12 mil) mask-defined circular pads (MD)
• 125 µm (5 mil)–300 µm (12 mil) copper-defined square pads (CD)
• 125 µm (5 mil)–300 µm (12 mil) mask-defined square pads (MD)
• 125 µm (5 mil)–300 µm (12 mil) wide by 50 mil long copper-defined rectangle pads (CD)
• 125 µm (5 mil)–300 µm (12 mil) wide by 50 mil long mask-defined rectangle pads (MD)

The stencil was wiped each time to eliminate paste volume increase due to paste spread under the stencil. However, this minimizes paste volume deviations one might see if no wiping was done. Next, ten boards were printed without stencil wiping. Pictures were taken by the Parmi SPI of solder bricks after the first and last print. Pictures were taken of the underside of the stencil by the Speedline printer.

Stencils
Twelve different stencils were tested. There were four different stencil technologies and three different post-coating techniques used for each of the four stencils. The three post-coating techniques were: 1) no post processing coating, 2) Nano Coat type A applied, and 3) Nano Coat type B applied. The four stencil types are described below:

Laser FG is laser cut stencil using fine grain stainless steel with normal dross removal but no electropolish.
NiCut is laser cut electroform foil with normal dross removal but no electropolish.
E-FAB is normal electroformed stencil.
NicAlloy is laser cut fine grain stainless steel with electropolish and nickel plating.

Note: These stencil type identifications are used as a short description of the stencils to shorten the names used in graphs and curves and are not a trademark of any company.
Performance summary in the 5 categories of testing

Paste volume results

Parmi SPI was used to measure solder paste volume and calculate solder paste volume standard deviations. Both of these parameters were plotted versus area ratio. Sometimes these parameters are plotted versus nominal aperture size. However, the actual aperture size and actual stencil thickness may vary. For this reason we chose to plot paste volume and paste volume standard deviation versus area ratio. The area ratio was calculated using the actual aperture size and stencil thickness for that particular aperture.

Figures 1-3 show the percent of solder paste volume and percent of solder paste volume standard deviation for circle apertures for all four stencils with no coating, Nano Coat A, and Nano Coat B respectively. It is interesting to note that the mask-defined pads provide better paste transfer and lower deviation at lower AR in all 12 stencils. Also of interest is the E-FAB stencil with Nano Coat B provides the best paste transfer and lowest deviation of all twelve stencils.

Figures 4-6 show the results for square apertures. The square apertures provide better paste transfer and lower deviation as a general rule across all twelve stencils. Figure 7 shows results for the rectangle apertures. The lowest area ratio, shown at the left on the X axis, represents an aperture width or 125 µm (5 mil). This clearly illustrates when referring to aperture size the difference between a square/circle and rectangle is significant.

Figure 8 is a bar chart for circle and square apertures for all 12 stencils showing the lowest area ratio attained using the >80% transfer and <10% deviation rule. Figure 9 is a tabulation of these results. E-FAB with Nano Coat B provided the lowest area ratio and mask-defined squares provided the lowest area ratio for each stencil. Figure 10 shows the ranking of all 12 stencils for lowest area ratio achieved in the four categories, circles and squares with both copper-defined pads and mask-defined pads.

Aperture wall quality

Figures 11 through 14 show the aperture walls for 125 micron (5 mil) aperture of all 4 stencils with the 3 different coatings at 700 magnification looking at the aperture wall opening at a 9 degree angle using a Keyence microscope. The same back and front lighting were used in all pictures. Pictures were taken with the contact side facing the scope. There is a slight glare on the E-FAB aperture edge. This is due to the aperture edge build up (gasketing effect) at the aperture edge. The E-FAB produced the smoothest walls. NiCut was the next smoothest wall.

Paste volume/spreading changes 1st to 10th print without wiping

Ten consecutive prints without any under stencil cleaning were performed using the Momentum printer. Parmi measurements were made after each print capturing pictures of the 200u (8 mil) rectangle solder bricks. The solder volume of these bricks was also recorded after the 1st and 10th print. Figure 15 shows the Parmi solder brick pictures for Laser FG with Nano Coat B, the worst performing stencil of
Print performance studies comparing electroform and laser-cut stencils

the group of 12. Figure 16 shows data for NiCut with Nano Coat B, the best performing stencil of the group of 12. The upper left corner shows Solder bricks for circles, squares and rectangles, the smallest being 75 microns (3 mils). A red X indicates excess solder paste and a blue shaded area indicates insufficient solder paste. The five solder bricks boxed off are shown enlarged on the right. It can be visually seen that the enlarged solder bricks are the same for the 1st and last print in Figure 16 but change remarkably in Figure 15. In this evaluation section stencils are ranked as to how stable the paste volume is after 10 prints with no stencil wiping. Figure 17 is a summary of the % volume change for 10 of the 12 stencils. Unfortunately two stencils were left out with no data collected for this section, namely Laser FG and NiCut with no coatings.

Paste Smear between solder bricks after 10 prints without wiping the stencil.
In this category the spread of solder paste for 150 µm (6 mil) apertures with 150 µm (6 mil) space between apertures was evaluated. Ten prints were performed without wiping the underside of the stencil. Pictures of the solder bricks are shown in Figures 18 through 20. Each stencil was rated from (E) Excellent to (P) Poor which are shown on each picture. Unfortunately the NiCut stencil without coating picture was not captured. It was assigned a natural rating of 2 for this category. In general the E-FAB stencil had similar performance with all 3 coating conditions. NiCut showed significant improvement from Nano Coat A to Nano Coat B. Surprisingly the Laser FG had had poor results with no coating and Nano Coat B but good results with Nano Coat A. Figure 21 shows stencil rankings for the paste smear category.

Paste Smear on bottom of stencil after 10 prints without wiping the stencil.
Another visual measure of stencil print performance is the residual solder paste left on the bottom of the stencil after several prints without wiping the bottom side of the stencil. The Momentum Speedline printer has the ability to capture a picture of the bottom side of the stencil. Pictures of paste smear were recorded after the 1st print and after the 10th print with no under stencil wiping for all 12 stencils. Figure 22 shows the worst performing stencil for bottom side paste smear after 10 prints without bottom side stencil wiping. Figure 23 shows the best performing stencil in this category. Figure 24 is a summary of the performance of all 12 stencils for bottom side paste smear.
Figure 25 shows the rankings of the 12 stencils in all five categories. The E-FAB, Electroform, stencil with Nano Coat B had the best overall ranking. NiCut, Laser-cut Electroform foil, scored second in the rankings. The NiCut with Nano Coat B provided the cleanest print after 10 prints without stencil wiping. E-FAB with Nano Coat B demonstrated the lowest Area Ratios (.33-.39). Mask-defined pads generally provided lower area ratios for all 12 stencils compared to copper-defined pads. Square apertures provided lower area ratios compared to circular apertures. Rectangles having the same aperture widths as squares and circles provided better paste transfer and lower standard deviations mainly due to their higher area ratios.

Future work
It was observed that smearing and paste volume varied widely among the 12 stencils from the first to the twelfth print. However, the minimum area ratios calculated from ten prints wiping the underside of the stencil after each print were within a relatively small range (.33 to .51). Paste

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Print performance studies comparing electroform and laser-cut stencils

Volume and paste volume standard deviation will be performed on the same 12 stencils with no underside stencil wipe between the sequence of 10 prints.

References
2. William Coleman “Stencil Considerations for Miniature Components”, SMTAI 2009 San Diego Oct 4-8
5. Rita Mohanty “Advance in Broadband Printing”, SMTAI 2009 San Diego Oct 4-8
7. William Coleman “Step Stencil Design When 01005 and .3mm Pitch uBGAs Coexist With RF Shields”, APEX Proceedings 2009 Las Vegas April 1-3 2009

Figure 23. Best stencil for bottomside paste smear.

Figure 24. Ratings for bottomside paste smear after 10 prints without wipe.

Figure 24. Ranking of the 12 stencils.
Layer by layer—multilayer printing for high-performance electronic components

Michael Heilmann and Franz Padinger, BOTEST, and Franz Plachy, EKRA

The term “printed electronics” represents a trend reversal in electronics production. It means that new product features, new functions, and simplified production processes will in future be found in the market. Often, however, the printed layers are too thin to achieve the required electrical properties. The solution is multilayer printing. Thanks to this, several layers can be printed on each other in order to obtain high-performance structures and electronic components.

Specialists at work
The company EKRA, located in Bönnigheim near Stuttgart, offers special thick film solutions in the HYCON product portfolio. Besides standard SMT applications, EKRA has specialised for decades in products for niche markets such as printing on hybrids, glass, wafers, flexible foils, but also direct printing of functional layers.

The subsidiary BOTEST is a member of the ASYS group like EKRA, specialising in paste development as well as developing and optimising new printing processes. The research laboratory in Linz is where further components of the printing process, such as screen, stencil and printing medium, are adapted to each customised application. Dedicated solutions optimally matched to the specific customer process can thus be offered from a single source.

The functional printing of electrically conductive pastes opens new production methods for the electronics industry. However, the conductivity of the ultra-thin layers, which are often only a few microns thick, is limited. Larger currents can be transported over tiny printed ridges only with significant electrical losses. Combined with high resolution, this is a challenge. Printing machine manufacturers, process technologists and paste developers are requested here to create the technical conditions for positionally accurate multilayer printing.

The following shows the production of prints with electrically conductive pastes and an excellent ratio between print dot height and print dot diameter (= aspect ratio).

The printed dots have a diameter of approx. 70 µm and require for their function as elastic contact pads a height of also 70 µm. The distance to neighbouring contact pads is also approximately 70 µm thanks to a staggered structure of the contact points. With an active area of 180 mm x 255 mm, this results in approximately 2.3 million contact pads to print. Stencil printing was chosen as the method to use, with up to four layers printed one above the other, to achieve the desired aspect ratio of nearly 1.

Printing parameters
An EKRA inline printing system was used for printing on a flexible PE foil substrate. The print nest available was an aluminium print-nest with glued poroplast and vacuum suction. This made it possible to create a highly homogeneous support surface for the substrate.

**Figure 1.** Multilayer printing of elastic electrodes w/80X magnification, dot diameter approx. 85 µm, aspect ratio approx. 0.8.

**Figure 2.a** Print image with a squeegee angle that is too flat.

**Figure 2b.** Example of a squeegee angle that is too steep. In both 2a and 2b, the print dots are “smeared,” resulting in a smudgy print image.
The printing paste was specifically developed by BOTEST to achieve the required parameters with regard to conductivity and elasticity of the pads to be printed. Thus, the rheological properties of the printing paste could be perfectly adapted to the used printing parameters and the coating of the stencil.

**Multilayer printing: The printing process**

The stencil was preflooded while printing the electrically conductive paste. Although this is uncommon in stencil printing, it is indispensable here.

After the printing process, the printed substrate was removed and dried in the oven. To prevent the foil from warping at temperatures or due to influence from humidity, it was adapted again to the environmental parameters after drying. Before the next printing step, the substrate had to be precisely positioned on the printing table again. This was done using the patented optical positioning system EVA™, which is built into the EKRA printer.

In addition, the gap between the substrate and stencil and the down-stop at the squeegee head had to be adjusted to prevent the printing paste from flowing under the stencil. This process was repeated up to four times, so that the height of the contact pads could be reached.

**Influences of the process parameters**

The printing results could be optimised thanks to tuning three parameters: stencil, process parameters and printing paste. The following sections evaluate specifically the influence of the process parameters during the printing process.

**Squeegee angle**

Figure 2 shows microscopic images of prints with squeegee angles that are too steep or too flat. If the squeegee angle is too steep, the printing paste smears below the stencil, creating a smudgy image. This in turn would cause a “shorting” between the individual contact points. A squeegee angle that is too steep leads to uneven “filling” of the stencil openings.

**Squeegee pressure**

Excessive squeegee pressure (Figure 3), just like a flat squeegee angle, results in “smearing” of the printing paste below the stencil and hence a smudgy, distorted print image. This deformation of the pads also makes the exact positioning of the next printing layer difficult in multilayer printing. In addition, the print dots spread due to the excessive squeegee pressure, which also increases the risk of shorting. Continuous monitoring of the squeegee pressure and closed-loop control of the EKRA printer allow a homogeneous distribution of the squeegee pressure over the entire squeegee path.

**Print direction**

An essential factor in high-resolution multilayer printing is the print direction. The squeegee pressure slightly “warp” the stencil. If the print direction changes while the multilayer print is being composed, it will negatively affect the printing result. The underlying dots can no longer be matched despite precise positioning by means of the alignment system. In this case, there can be deviations of more than 20-30 µm per layer, as shown in Figure 4. This offset can be determined and compensated by entering it in the software of the printer.

**Positioning accuracy**

To obtain the best possible positioning accuracy, it is important to align the layer to be printed only with the base fiducials. If other markers, for example fiducials that were printed later, are used for the alignment, the deviations accumulate. In a realised multilayer print consisting of four layers, the difference with regard to repeatability could be optimised and an overall
deviation for 4 layers of ±12.5 µm could be reached. This result could be achieved using the patented optical positioning system EVA™ and using only the base fiducials for alignment.

**Results**

By means of evaluating the optimal parameters, it was possible to achieve very good print results (Figure 5). Thanks to multilayer printing, the base of the contact pads spreads from 65 µm – 70 µm (monolayer printing) to approximately 85 µm – 93 µm, as shown in Figure 6. The adjacent electrodes are not contacted on the underlying base electrodes structured in the ratio of 70:30 (70 µm wide with 30 µm distance to the next electrode). This allows a proper electrical function of the elastic contact pads.

Figure 7 shows the height of the individual contact pads. Thanks to multilayer printing, a height of 55 µm to 65 µm could be achieved for the individual contact pads, which corresponds to an aspect ratio of approximately 0.8.

**Conclusion**

Thanks to the optimal interaction between printing parameters and the printing paste, the print results for high-resolution multilayer printing could be markedly improved. With an optimised aspect ratio of printed structures in multilayer printing, it is possible to create highly conductive structures. They can be used for efficient transport of electricity and represent an attractive option in future electronic production.

However, prerequisite for optimum positioning of the solder deposits is a high-precision screen and stencil printer. Thanks to clever machine features, such as closed-loop squeegee pressure control, the patented optical positioning system EVA™ and a variety of different alignment options, EKRA printers provide for precision and process stability. Besides the drive unit consisting of a servo motor and a resolver, the print system comprises an additional built-in scale with a resolution of 1 µ. This allows monitoring and, if possible, correcting when the target position is reached even in case of mechanical wear.

Since all EKRA stencil printers are equipped with these features, users of PCB printing applications benefit from the mentioned advantages as well. Hence the exact placement of minimised solder paste deposits, as required e.g. for the component size 03015, is no longer merely a vision of the future. All inline printing systems of the SERIO product family and the new SERIO 4000 printer platform are “03015-ready” already today.

---

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Global outlook: Modest year-on-year and sequential growth

Modest growth has returned to the global electronics industry. After expanding 6.1% in 4Q’13 vs. 4Q’12 electronic equipment sales grew an estimated 2.9% in the first quarter of this year compared to the same quarter a year earlier (Chart 1). Although the industry experienced its normal first quarter seasonal slowdown, it is again expanding year-on-year.

Based upon composite sales of groups of companies making similar product, most (but not all) sectors of the electronic supply chain returned to growth in the first quarter (Chart 2), with semiconductor capital equipment and most components leading the way.

EMS and ODM companies are participating in the current expansion as the composite revenues of 53 of these companies rose 11% in 1Q’14 vs. 1Q’13. They had their normal first quarter seasonal dip but were up year-on-year (Chart 3).

Based upon data through April the Taiwan listed ODM companies have recovered from the post-Christmas & Lunar New Year downturn and should start growing again in late spring (Chart 4).

For printed circuit boards (Chart 5) the Asian seasonal recovery had already begun by April with sequential growth likely to continue until October or November of this year. Even Japan, N. America, and Europe’s PCB sales are growing a small bit!

Looking forward, and thanks to Ed Henderson, electronic equipment growth (Chart 6) is expected to register mid single-digit growth for the next few years.

There are no booms or bust on the horizon however we live in a fragile financial climate so keep an on the numbers!

End markets

Worldwide IT spending forecast downgraded to 4.1% growth by IDC due to emerging markets and mobile device slowdown.

Computers & peripherals
- PC shipments declined 1.7% y/y to 76.6 million units in 1Q’14.—Gartner
- Laptop computer shipments are expected to decline by 1-2% in 2014 and will return to positive growth of 2.8% in 2015 and 3.6% in 2016.—TrendForce
- Branded tablet shipments reached 41 million units in 1Q’14; Apple and Samsung combined for 71% market share.—ABI Research
- White-box tablet shipments decreased 27.4% q/q and 2.4% y/y to 20.4 million units in 1Q’14.—Digitimes Research
- Personal & entry level storage shipments declined 6.9% y/y to nearly 19 million units in 1Q’14.—IDC
- Worldwide sensor hub shipments are expected to grow 154% y/y to 658 million units in 2014.—IHS

Telecom and datacom
- Smartphone shipments rose 1.13% q/q to 266.9 million units in 1Q’14.—TrendForce
- Home network penetration is expected to climb from 24.8% in 2013 to 33.2% by 2018.—ABI Research
- Passive optical network equipment market is expected to grow at a 22.7% CAGR from USD 4 billion in 2013 to USD 13.6 billion in 2019.—Transparency Market Research

Displays
- Flat panel display revenues are will expand 1% y/y to $131 billion in 2014.—NPD DisplaySearch
- Professional flat panel display shipments increased 8% q/q in 4Q’13 to 567,000 units, finishing 2013 with
Global Electronic Supply Chain Growth 1Q’14 vs. 1Q’13 (preliminary)

US$ equivalent at fluctuating exchange; based upon industry composites including acquisitions

Global EMS & ODM Companies Composite of 53 Public Companies

Revenue

Taiwan ODM Companies Composite Sales of 11 Large Manufacturers

World PCB Monthly Shipments Converted @ Fluctuating Exchange Rates

20% volume growth.—FutureSource Consulting
- Touch panel revenues are expected to decline 1%, while shipments are forecast to rise 15% in 2014.—NPD DisplaySearch

Other
- 3D printer sales for home-use will grow from 44,000 units in 2014 to over 1 million units globally by 2018.—Juniper Research
- Taiwan ministry committed NT$70 million ($2.33 million) each year to help local development of 3D printing technology.
- Enterprise wearables market will grow at a 56.1% CAGR to US$18 billion by 2019.—ABI Research
- Wearable device shipments are expected to grow at a 78.4% CAGR from over 19 million units ($US6 billion) in 2014 to 112 million units ($US20.6 billion) in 2018.—IDC
- Medical robotic systems market will grow at 16.1% CAGR from $1,781 million in 2013 to $3,764 million by 2018.—MarketsandMarkets
- Smart home connected appliance installations are forecast to rise from 4 million units in 2013 to over 10 million in 2017.—Juniper Research

EMS, ODM & related assembly activity
Top 50 EMS providers’ sales grew 1.9% y/y to USD 254.3 billion in 2013—Manufacturing Market Insider
German electronic components (in-house manufacturers and electronic manufacturing services provider) market is expected to increase 4.5% to 26.1 billion Euros in 2014.—ZVEI PCB and Electronic Systems
Assel invested in a new Vitronics Soltec Delta 5 wave soldering equipment.
Asteelflash closed its Owego, New York plant.
Cirtech hired and appointed Rick Pelletier, Ex. VP.
Conelec Electronics Manufacturing hired Mark Flynn as Director of Supply Chain Management.
Creation Technologies relocated its Design Center to a 16,000 SF facility in Golden, Colorado.
Datest is celebrating its 30 year anniversary. Congrats Bob & Regina!
Digicom Electronics received ITAR certification.
ECR appointed Dan Negrea, CEO and Werner Fischer, Sales Director.
Enics
- Slovakia appointed Miroslav Sagan, GM.
- Suzhou expanded its facility to 5500 SM from 1500 SM.
ESCAtec installed an Elite EM-5700N PCB router in Switzerland.
Fercad Elektroin added three Juki SMT assembly lines and a JUKI RS-1000N nitrogen oven.
Firstronic named Steve Fraser, VP of Operations.
Flextronics
- is investing $15M and hiring 300 new employees in North Austin, Texas.
Global outlook: Modest year-on-year and sequential growth

$62.294 billion in 2014.—ZVEI PCB & Electronic Systems

German PCB market is forecast to grow 3.9% y/y to approximately 1.43 billion Euros in 2014.—ZVEI PCB and Electronic Systems

Advanced Circuits is celebrating its 25th anniversary.

Aspocomp Group appointed Mikko Montonen, President and COO.


Daeduck Electronics began mass-producing four-layer FC CSP measuring 25~30 micrometers in line width for low-end mobile application processor market.

Elmatica appointed Michel Buia, Country Manager for French operations.

Fitec International Group’s factory in Vietnam was torched and looted by protesters.

Garden Services USA added Titan AOI equipment in Dallas, Texas.

GCL-Poly acquired 67.99% controlling stake in Same Time Holdings.

IBM purchased i3 Electronics CITC testers for in-house PCB reliability testing.

Innovative Circuits added an Orbotech Sprint 120 Inkjet printer.

Invotec Group appointed Thomas Witt and Monika Braun as Sales Agent and Sales Assistant for Germany.

IPC President’s awards recipients were: Daniel Gamota, Jabil Circuit; E. Eddie Hofer, Rockwell Collins; Gerard O’Brien, Solderability Testing & Solutions; Richard Rumas, Honeywell Canada; Tony Senese, Panasonic Electric Works; and Donald Walsh, Uyemura.

Kyocera consolidated its North American sales and technical operations of Kyocera SLC Technologies and Kyocera Circuit Solutions USA into Kyocera America.

LG Innoteck expanded middle to low-end AP product line ranging from high-end six-layer FC CSP measuring 20 micrometers in width to four-layer model measuring 30 micrometers in line width.

Malmö Mönsterkort AB appointed Jonas Wackerfeldt, CEO.

Merlin Circuit Technology installed a new MECetchBOND process.

Precision Technology added a KISS–102 selective soldering system from ACE Production Technologies.

Shennan Circuits began small-volume production of wirebond substrates with mass production to start in 3Q’14.

Siber Circuits received UL listing for Aismalibar’s Cobritherm line of insulated

- joined Power Matters Alliance Board of Directors.
- Medical Group received contract to provide design and manufacturing services to Ichor Medical Systems for TriGrid™ DNA delivery systems.
- Foxconn/Hon Hai
- raised pay at subsidiaries: Innolux, Foxconn Technology and Zhen Ding Tech.
- appointed Accel Frontline as their warranty service partner for Motherboards in India.
- and HP entered JV agreement to create a new line of cloud-optimized servers specifically targeting service providers.
- sold its communications technology patents to Google.
- suspended operations in Vietnam for three days “out of concern for workers’ safety during the May riots.
- Grossenbacher Systeme added THT automation technology from JUKI Europe in St Gallen, Switzerland.
- Kingfield Electronics refurbished its 3000m² Derbyshire location.
- Kitron
- appointed Peter Nilsson, CEO.
- Arendal, Norway received a NOK 80.7 million order from Kongsberg Defence & Aerospace for military communications equipment.
- Lacroix increased its overall manufacturing area to 12,000 M2 in Kwidzyn, Poland.
- Libra Industries appointed Gerry Waldron to Director of Product Realization and promoted Bruce McKee to Program Manager.
- Nam Tai Electronics terminated its electronic manufacturing and design services business and changed its name to Nam Tai Property Inc.
- Neways acquired BuS Holding GmbH.
- PartnerTech
- appointed Stefan Hansson-Mutas, Acting President for Electronics Technology division.
- received 3 MEUR contract to provide PCBAs for Exide Technologies.
- Plexus
- appointed Patrick Jermain, CFO.
- spent €1.6m for additional SMT placement line in Kelso, Scotland.
- REStronics appointed Luke Elliott to South Central U.S. territory (Iowa, Missouri, and Kansas) sales team.
- Saline Electronics implemented Cogiscan’s Track, Trace and Control system.
- Silicon Mountain installed Universal Instruments Fuzion4-120 high-speed and Fuzion2-37 flexible platforms.
- SMTC appointed Jim Currie, Interim CFO.
- Varitron Group acquired Altronics Manufacturing.

PCB fabrication

World PCB market will grow 4% y/y to

Electronic Equipment Production Growth

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Henderson Ventures 5/2014
www.hendersonventures.com

Chart 6.

Global SMT & Packaging – June 2014
metal substrate materials. Simmtech plans to begin mass-production of four-layer 25 micrometers width FC CSP for middle to low-end AP market in 2H’14. Taiwan PCB Techvest plans to increase its PCB capacity to 1.5 million SF/ month by the end of 3Q’14. Teknoflex Interconnect Solutions passed AS9100C audit. Unimicron increased HDI board production the utilization rate to 80-90% due to strong demand from the smartphone sector. Unitech will spend NT$1.5 billion (US$49.62 million) to ramp up its production capacity of any-layer HDI boards and flex-rigid boards in 2014. WUS Printed Circuits and Schweizer Electronic entered long-term HF PCB production cooperation agreement.

**Materials & process equipment**

Agilent Technologies
- appointed Paul Clark and James Cullen to Keysight Technologies Board of Directors.
- named Jay Alexander, CTO of Keysight Technologies.


**Photo Stencil**
- added a 35,200 SF manufacturing plant in Golden, Colorado.
- installed its 3rd laser cutting stencil system in Guadalajara, Mexico.

**SMT North America** President, Manfred Maehl retired.

Spartanics appointed David Birch, Business Development Manager. Teknek sold its 20,000th clean machine in March, 2014. Tektronix opened a calibration facility in Salt Lake City, Utah.

Teledyne
- named Rex Geveden, CEO of DALSA division; Brian Doody retired.
- appointed Janice Hess to President of Engineered Systems segment.

Universal Robots opened a 12,000 M2 headquarters in Odense, Denmark.

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Alpha Celebrates 10th Anniversary of Innovative SACX® Alloy

Alpha launched its innovative new lead-free, low-silver (Ag) solder alloy – ALPHA SACX® – in 2003, which enabled the conversion from traditional SnPb alloys to lead-free alloys in response to the RoHS regulations introduced in the European market. In addition to facilitating this transition, SACX® delivered:

- SAC305 soldering performance
- 30% lower cost vs. SAC305
- Protection from Ag cost volatility
- Tougher solder interconnects vs. alloys without Ag
- Significantly improved resistance to drop shock compared to higher Ag alloys.

Today, leading global electronics manufacturers in many markets are using ALPHA® SACX Plus® alloys to assemble their electronic devices which touch the lives of millions upon millions of people around the world. ALPHA® SACX Plus® is available in:

- Low-Ag alloy options each engineered for specific customer applications: 0107, 0307, 0307 HASL and 0807
- Bar, solder wire, preforms, spheres and solder paste, providing alloy compatibility for a wide range of applications
- ALPHA®'s proprietary Vaculoy® manufacturing process, which maximizes alloy purity


2014 Global Technology Awards

(get recognition for the things your company does best)

- Adhesives/Coatings/Encapsulants
- Assembly Tools
- Bonding Equipment
- Cleaning Equipment
- Cleaning Materials
- Tier 1 Contract Svs (> $100M)
- Tier 2 Contract Svs ($50-100M)
- Tier 3 Contract Svs ($25-50M)
- Tier 4 Contract Svs (< $25M)
- Dispensing Equipment
- Flux
- Hand Soldering
- Inspection—AOI Systems
- Inspection—SPI Systems
- Inspection—X-Ray Systems
- LED Production Equipment
- Placement Equipment—Low to Medium Volume
- Placement Equipment—High Volume
- Printing Equipment
- Programming
- Rework & Repair
- Software—Process Control
- Software—Production
- Solder—Bar and Cored Wire
- Solder Paste
- Soldering Equipment—Reflow
- Soldering Equipment—Selective
- Soldering Equipment—Wave
- Soldering Equipment—Other
- Stencils
- Storage Systems
- Test Equipment
- Test Services

The Global Technology Awards have been recognizing the very best new innovations in the printed circuit assembly and packaging industries since 2005. Each year, the field of entries is scored by an independent, international panel of judges on six different criteria—innovation, speed/throughput improvements, quality contribution, cost benefits, environmental consideration, ease of use/implementation, and maintainability/repairability—to determine the best new technologies and services introduced in the previous year.

Entries for the 10th annual Global Technology Awards are invited from equipment, materials and EMS companies of all sizes. The deadline is July 11, 2014. All products and services introduced between August 1, 2013 and July 31, 2014 are eligible. This year’s ceremony will take place September 30 at SMTA International in Chicago, Illinois. For more information, visit awards.globalsmt.net.
Alpha Celebrates 10th Anniversary of Innovative SACX® Alloy

Alpha launched its innovative new lead-free, low-silver (Ag) solder alloy – ALPHA SACX® – in 2003, which enabled the conversion from traditional SnPb alloys to lead-free alloys in response to the RoHS regulations introduced in the European market. In addition to facilitating this transition, SACX® delivered:

- SAC305 soldering performance
- 30% lower cost vs. SAC305
- Protection from Ag cost volatility.
- Tougher solder interconnects vs. alloys without Ag
- Significantly improved resistance to drop shock compared to higher Ag alloys.

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Uemura, USA, became an eSurface certified supplier.
Veeco appointed Shubham Maheshwari, CFO.
Vi TECHNOLOGY promoted Jean-Marc Peallat to Global Sales VP.
Viscom is celebrating its 30th anniversary.
Yamaha Motor IM supplied precision high-speed SMT systems to Carel’s international manufacturing network in Italy, Brazil, China and USA.
Zuken expanded E’series sales and training capacity in Germany.

Semiconductors & other components
Worldwide semiconductor industry sales reached record $78.47 billion 1Q’14.—SIA/WSTS
Worldwide semiconductor assembly and test services market grew 2.3% y/y to $25.1 billion in 2013.—Gartner
Worldwide semiconductor capital equipment spending declined 11.5% y/y to $33.8 billion in 2013; is expected to increase 12.2% y/y to $37.5 billion in 2014.—Gartner

Worldwide semiconductor materials market sales decreased 3% y/y to $43.5 billion in 2013.—SEMI
Worldwide semiconductor photomask market is forecast to grow from $3.1 billion in 2013 to $3.3 billion in 2015.—SEMI
European passives components market is expected to grow 1% y/y to 4.1 billion Euros in 2014.—EPCA
German semiconductor market will grow 5.4% y/y to 11.147 EUR million in 2014.—ZVEI PCB and Electronic Systems
Taiwan IC backend production value is expected to expand 5.9% y/y in 2014.—Digitimes Research
Bluetooth chipset shipments will increase from two billion units in 2012 to over three billion in 2015 and four billion in 2018.—ABI Research
Fabless chip market increased 8% y/y to $77.91 billion in 2013.—IC Insights
IC market is expected to reach US$285.9 billion in 2014, with communications systems accounting for 37.9% of the total, computer systems 36.3%, consumer electronics 11.2% and automotive electronics 7.6%.—IC Insights
Industrial electronics chip market revenue grew 9% y/y to $32.8 billion in 2013 and is expected to grow 11% y/y to $36.4 billion in 2014.—IHS
Tablet applications processor market revenues are set to grow at a 5-year 14.6% CAGR to $7.2 billion in 2018.—Strategy Analytics
Tablet microprocessors represented nearly 6% of worldwide MPU sales in 2013 compared to 4% in 2012, while cellphone application processors accounted for 25% of revenue total, up from 22% in 2012.—IC Insights
Worldwide sensors and actuators sales are forecast to grow 14% y/y to $9.9 billion in 2014 and an additional 16% y/y in 2015 to $11.4 billion.—IC Insights

Walt Custer is an independent consultant (www.custerconsulting.com) who monitors and offers a daily news service and market reports on the PCB and assembly automation and semiconductor industries. Jon Custer-Topai is vice president of Custer Consulting Group and responsible for the corporation’s market research and news analysis activities.

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www.globalsmt.net
Interview—
Jean Marc Peallat, Vi Technology

At the recent NEPCON China show, Trevor Galbraith spoke with Vi Technology’s VP of Sales, Jean Marc Peallat, about their latest solder paste inspection (SPI) system, the PI, which features 100 times the computing power of existing SPI systems, and is so easy to use that it requires no fine-tuning or specialized training.

We’re here at NEPCON China at the Vi Technology booth, standing in front of their latest SPI machine, the PI. This is actually, for me, one of the key new machines here at NEPCON China.

Yes, the PI is the newest technology from Vi Technology. We launched it last year at productronica. Today is the official launch in the China market.

It really is a very, very sophisticated machine. It really takes solder paste inspection quite a step up. Let’s start off talking about the camera technology. It’s got thirty-two five-megapixel cameras inside?

Exactly. This was a four-year project, with about twenty million dollars invested over the four years. We have thirty-two cameras that we manufacture ourselves. We have eight top-down projectors, and of course we also have LEDs to get the 2D pictures. The field of view is about thirteen inches by two inches. We have the whole picture in one time, so we take 352 images per field of view, and we compute all this.

That’s a huge amount of data; how do you handle that?

We have developed our own frame grabber in order to handle all the data at the same time. We transfer sixty-four megaflops of data, so it’s a lot of computing, and the computer is highly powered.

What sort of computer system are you using to compute this?

I cannot tell you too much on that, sorry. We have put a lot of parallel GPUs in it.
So you’ve got all the parallel processing in there, you’ve got your own frame grabber, you’ve written your own software... I take it it’s not based on the Windows system.

No, we have developed it on Linux in order to ease all of this transfer and to get better control in the system. Working with Windows blocks you in a certain area, and you have to do things in such a way. With Linux, we are able to do it our own way.

The processing time is fairly fast?

Yes, we are compatible with all cycle time, line cycle time. We do a scan, and step by step we move the head across the board, taking a field of view of the whole board.

You’re taking steps of one field of view moving forward.

Exactly, yes.

The obvious question is that it must be quite expensive because there’s an awful lot of technology in there.

And surprisingly, no. We are compatible with the market price, even though we bring a lot of innovation with this machine, not only the technology but also the interface. It’s the first machine on the market that’s auto-programming. There’s no fine tuning. There’s no human intervention on the programming. It’s a good solution, especially here in China, where the turnover is quite high. It’s always difficult to find people, train people. With this system, there is no need of training.

That’s one of the beautiful things about it. The interface is very easy to use. It’s all GUI and touch screen.

It’s the first software developed for touch screen. It’s like an iPad. You don’t think of using your keyboard and mouse on the iPad: here it’s the same. It’s very intuitive. And with the new generation, all the new kids are very familiar with this. They learn it easily.

Presumably it changes into numerous different languages.

Of course, we have Chinese, German, English, obviously, and Spanish.

Thank you very much, Jean Marc, for giving us a look at the Pi. Of course if you want more information, you’ll get it on the Vi Technology website at www.vitechnology.com.

—Trevor Galbraith
In-process X-ray inspection improves quality control, cuts costs

Renaat Van Cauter, Nikon Metrology

Swiss-owned electronic and mechatronic systems manufacturer ESCATEC has deployed a new X-ray inspection machine that sits alongside two lines producing printed circuit board assemblies (PCBA) at its factory in Heerbrugg. Supplied by Nikon Metrology, the XT V 160 machine is used for real-time, in-process quality control and replaces post-process X-ray inspection methodology. The in-line procedure is more efficient at detecting defects, has reduced the lead-time from order to delivery by one day, and optimizes costs by freeing an operator and a test engineer to be deployed elsewhere in the factory.

“Modern electronic components are becoming smaller and smaller,” says Dr Martin Muendlein, Engineering Manager at the ESCATEC plant, “increasing the need for sophisticated techniques to ensure that every solder joint is perfect. Visual inspection is also increasingly difficult as more and more leads are hidden under the components, which means that the solder joints are only detectable by X-ray.

“We needed an inspection system that overcame this problem and approached Nikon Metrology for help. The XT V 160 X-ray inspection system was installed as part of a continuing process optimization program, enabling us to look at hidden solder joints with an image resolution down to 1 micron. Due to this precision we can now meet the increasingly stringent quality control requirements demanded by the miniaturization of electronics.”

Detection rates using the company’s two previous X-ray systems had fallen from 100 percent to around 70 percent over the past decade as the features of interest on PCBAs became smaller and more difficult to inspect. All boards produced were checked half a day or one day after they...
In-process X-ray inspection improves quality control, cuts costs

were manufactured to determine if they had passed or failed.

The new X-ray inspection system has the ability to zoom in to 2,400X magnification ensuring all features are investigated, despite their smaller size. Its installation, on the factory floor, just a few meters from two SMT (surface mount technology) production lines, has also brought a fundamental change to quality control at Heerbrugg making it an in-process rather than a post-process function.

The system is being used during SMT as a tool for verifying that the manufacturing process is operating at a high quality level.

According to the defined sample rates of between 5 and 10 percent, PCBAs are inspected and analyzed immediately after solder reflow. Findings are continuously fed back to the SMT lines to optimize production parameters. Results are then stored in test logs for traceability.

“...it has been a fundamental shift in our quality control procedures,” says Dr Muendlein, “whereby we monitor and manage the performance of the SMT lines, rather than find out a day later how many defective boards we have.

“Sporadic defects in hidden solder joints will not be detected by sample inspection but systematic defects are reduced by 20 percent, which means we end up with more good boards.”

The introduction of the system has improved delivery lead-times and the engineering effort needed for inspection was also reduced.

The new inspection process

Manufacturing of PCBAs is complex and both SMT lines are changed over up to seven times per day on average. Batch size is typically between 50 and 100 boards. Only between 5 and 10 percent of all possible PCB defect, mainly lack of solder joint integrity or shorts under BGAs, QFNs, etc., are detectable by X-ray. Positioning and orientation of components on boards are inspected in-line on automatic optical inspection (AOI) machines that view all of the boards produced. The same team of inspection operators at Heerbrugg is in charge of both the 100 percent optical inspection and sample X-ray quality control.

The latter is a semi-automatic process. More than 250 different PCBAs are produced at the site, most of them double-sided. First, a program for each side is written to instruct the XT V 160 to run sequentially to all the spots of interest on the board. With a near-perfect example of any particular PCB (golden board), a sample inspection protocol with reference images is created so that the operator is able to compare an actual image with the reference image. This process is usually done through an operator’s visual inspection and a decision is then made of its quality.

Purchasing decision

This is not the first time such a system has been installed within the company. The Malaysian site was the first to evaluate and install two of the X-ray machines. The system has an image intensifier detector for checking boards of lower sophistication and the other a flat panel detector. The latter is capable of inspecting more complex, multi-layered boards and was the model chosen for Heerbrugg after further extensive trials.

A problem found with previous X-ray machines was that they were based on a different technology involving automated laminography and needed complex test programs written. The inspection process was carried out in two steps. First, all PCBs were automatically inspected and separated into good boards and bad boards with suspected faulty solder joints. During the second step, an operator inspected the
In-process X-ray inspection improves quality control, cuts costs

In-process X-ray inspection improves quality control, cuts costs

latter boards to verify which were good and which really contained faulty joints.

This type of machine is limited in that it can look at slices only from the top and bottom of the sample. There was no way to tilt the flat panel so that the operator could view the sample from the side. Additionally, the image resolution was not always sufficient for the decision process, especially for fine pitch BGAs, QFNs and similar. It is very difficult to see certain defects from one end of a PCBA, such as a BGA solder joint defect known as head-in-pillow. It is of major concern in the electronics industry, as the joint may have electrical integrity in the beginning but insufficient mechanical strength, making it prone to failure in the field, leading to costly repairs.

The newly installed system had the ability to tilt the sample by more than 70 degrees, combined with variable magnification, allowing head-in-pillow and other defects to be seen easily by the operator. A further advantage is the open tube design, allowing simple replacement of the 160 kV/20 W filament source, unlike on the former X-ray machine which had a closed tube.

Having tested and reviewed a number of different potential suppliers, the decision was made to install the XT V 160 as it was the best fit for ESCATEC’s application, as its cost-to-performance ratio was better than that of the other machines evaluated and its features best suited the requirements of the company.

Extending the analysis possibilities with CT

“Our Penang facility’s XT V 160 has CT fitted, but it is used in the laboratory rather than for process control,” says Dr Muendlein. “For testing new solder profiles and for failure analysis, we may consider this retrofit for our system as well, as it would allow us to view a full 3D model of a board. If you have overlapping components, you cannot see them at any viewing angle, even with X-ray—the only way is to use CT.”

Non-destructive testing applications for XT V systems extend beyond surface mount technology, and include through-hole boards, integrated circuit bonding and wafer level interconnectivity. Besides electronics inspection, the machines are also suitable for X-ray and CT inspection of a variety of small components, such as micro-electro-mechanical systems used in consumer electronics such as smartphones, as well as accelerometers, pressure sensors and gyroscopes. Inspection of small cables, harnesses, plastic parts, LED lights, switches and medical parts is also possible.

About the Nikon Metrology XT V 160

High-precision, proprietary X-ray technology built into the XT V 160 X-ray inspection system facilitates efficient defect analysis of PCBAs in a smooth, non-destructive process. Designed for inspection of BGAs, multi-layer boards and PCB solder joints, the systems are intended for use in production lines and failure analysis laboratories.

The 5-axis sample manipulator is controlled with precision joystick navigation that drives real-time X-ray imaging, allowing defects to be traced intuitively and quickly on complex printed circuit boards and electronic components. 360-degree fly-around viewing is possible while keeping the region of interest locked into the centre of the field of view.

Other key attributes are proprietary micro-focus source technology, rapid automatic inspection using customizable macros, a dual display for combined measurement and real-time analysis, and the capability for the flat panel to be retrofitted with computed tomography (CT) scanning.

Complex boards often have stacked multiple layers, making X-ray a helpful tool to inspect individual components.

Left: Example of correct quad-flat no-lead connection. Right: Example of failed QFN joint connections due to lack of solder paste.
I’ve been at many sessions on the topic of industry 4.0 and even chaired or spoken at one or two. I’ve listened to those who think it is the key to success in higher cost environments, and I’ve listened to those who think it is pure marketing hype, and I’ve talked to many who have no idea what it is....

To many it seems like a German, or at least a European, initiative. In the US the government is more focused on creativity and innovation, with Barrack Obama supporting a number of initiatives, while also supporting some substantial automation initiatives with serious funding behind them.

My view? I see industry 4.0 as a nice way to bring a group of trends together under one name. I’m pretty sure no one was aware of the term industry 1.0, 2.0, or 3.0 when those milestones occurred. The trends brought under the 4.0 banner include the Internet of things (IoT), mass customization, big data & cloud computing, lot size of one, lean manufacturing, and robotics or custom automation.... All these are real trends with real impact, and if you can bring them together in a cyber physical system, where everything connects via a sensor in each individual product, it is probably industry 4.0, or at least something very close. Truth be told, everyone is working somewhere between 3.0 and 4.0. I suspect I’ve never seen 4.0, but I’ve probably seen 3.7 or so, and I see the value it adds.

To be clear, I support any initiative that creates dialogue and innovation in the supply chain and its improvement, whatever it’s called!

Anyway, while Germany is focused on smart manufacturing and smart machines, and the development of a smart supply chain, America is focused on how innovations can be supported, nurtured and developed. Incidentally, I suspect the UK is closer to the US in this debate, while Asia, particularly China, is keen to get the best of both, watching, waiting, and adding in a more efficient and lower cost supply chain. Innovation support can come in a number of formats, from apps like Kickstarter and trends like crowd-funding, as well as manufacturing support through initiatives like Flextronics’ Product Innovations Centers (PIC) and Lab IX bringing incubation, secure development, and venture capital together. The electronic manufacturing services (EMS) world seems to favor innovation over Industry 4.0, while still being focused on automation and manufacturing excellence, driven by the continuous need for cost savings and the consumer’s desire for high speed mass customization and direct fulfillment.

Supporting innovation is key to winning business, growing the real electronics industry, creating game-changing products, and increasing the total available market (TAM) for the EMS industry, which by the way isn’t just EMS anymore. (I’ll come to that in another feature very soon.) Supporting better production techniques or manufacturing excellence is the key to fulfilling those ideas and innovations effectively, bringing them to market quickly, efficiently, and reliably. Add to that a fanatical requirement for traceability and product and material verification, and it is clear we need it all!

So, whilst I’m not a big fan of government interference in industry—in fact I’m not a big fan of government at all—I am a big fan of innovation, and I am a big fan of outsourced manufacturing and fulfillment. I’ve always believed the whole industry makes the most sense when innovation is promoted and those that are good at it can be left to focus in it, while those with the scale and scope of service to fulfill those innovations, to bring them quickly to a global market, and to support the whole life of the product, can focus on doing that safely, efficiently, and economically.

That way the innovators win from their creativity and are protected, the consumer wins by getting a good product at a reasonable price with decent reliability from a sustainable and responsible supply chain, and lastly the outsourced manufacturing and fulfillment industry wins by earning some margin for bringing the idea to the consumer, albeit a narrow margin in a competitive marketplace.

Win, win, win—who’d have thought it....

Philip Stoten has spent half his career in the electronics manufacturing industry and the other half as a journalist covering it. You can find his work on YouTube and you can follow him on twitter @philipstoten.
SMT Hybrid Packaging show videos

Global SMT & Packaging stopped by a number of booths to get the scoop on the latest in electronics manufacturing technology. We’ll be presenting more of these videos in the next few issues.

DEK at SMT Hybrid 2014
Trevor Galbraith talks to Rob Raine, Product Manager for DEK about the Gemini system at SMT Hybrid Packaging 2014

JUKI at SMT Hybrid 2014
Trevor Galbraith talks to Jürg Schüpbach about Juki’s full-line SMT solutions at SMT Hybrid Packaging 2014
**Speedline launches space-saving MPM® Momentum® BTB (back to back) printers**

SMT electronics assemblers can nearly double their stencil printing throughput without doubling their machine footprint with the new MPM Momentum BTB (Back to Back) printer. The MPM Momentum BTB is a space-saving 200 mm shorter than the standard Momentum with an overall length of 2.8 m for the two machines. Configured for Back-to-Back (BTB) processing, e.g., two individual printers positioned back to back in a manufacturing line, it enables dual lane processing with the combined output of two machines, conserving floor space and creating a shorter manufacturing line length.

www.speedlinetech.com

**MYDATA releases new MY600 Jet Printer**

The next-generation MY600 Jet Printer now enables SMT producers to achieve optimal solder joints on complex boards with a 50% increase in throughput, compared to earlier jet printer generations. Having pioneered jet printing of solder paste for electronics manufacturing, MYDATA is now introducing a further innovation to boost speed and quality. Called the MY600 Jet Printer, the new platform allows SMT producers to achieve high-precision solder joints at speeds of more than one million dots per hour. Increasingly, the jet printing of solder paste onto PCBs is being used at all levels of the industry to cope with complex broadband and mixed technology boards, among other factors. www.mydata.com

**Alpha launches SnCX Plus™ 07 wave solder and rework lead-free alloy**

New ALPHA® SnCX Plus™ 07 is a lead-free, silver-free alloy developed by Alpha, consisting of tin, copper and several unique additives designed to enhance alloy performance. It is engineered to be a cost effective alternative to other lead-free, silver-bearing alloys in terms of overall performance and reliability on standard complexity single and dual sided electronic assemblies. It can be used as a replacement for SnPb, SAC and other lead-free, silver-alloys in wave, selective soldering, lead tinning and rework processes. alpha.alent.com

**Juki releases new RS-600 six zone reflow oven**

Juki Automation Systems (JAS), Inc., announced the release of its new RS-600 Six Zone Air and Nitrogen Reflow Ovens. The new model will greatly assist Juki in promoting its “Total Line Solutions” sales strategy into LED and OEM accounts. The RS-600 reflow ovens offer the same feature set as the larger 8- and 10-zone ovens, such as; a top and bottom Independent Air Velocity Controlling System that allows for flexible processing control to easily handle complicated lead-free soldering requirements, a four way air recycling system in each zone, and an efficient power design and air management system.

www.jukiamericas.com

**Pantera X-plus—Essemtec’s proven pick-and-place system for small batches**

With more than 1500 installations worldwide, the Pantera X pick-and-place system from Essemtec offers new benefits for highly flexible small batch assembly. The field-proven machine was further developed and supplemented in order to better cover the ever-increasing demands for future component accuracy and diversity. The enhanced X-vision system includes further improved image processing for small chip components and complements the existing on-the-fly laser centering feature. The combination of fast laser centering and high-precision image processing now allows customers to achieve the best possible placement results in this machine segment.

www.essemtec.com

**KIC discontinues SlimKIC 2000 and KIC Explorer profilers**

KIC has announced that effective immediately the SlimKIC 2000 and KIC Explorer lines of profilers are no longer available for sale. The profilers have been extremely popular in the electronics assembly and semiconductor markets for the past several years. However, as new and improved technologies have been developed and implemented in KIC’s more advanced X5 profiler, the time has come to move on to a new generation of profile setters.

kicthermal.com
Nordson EFD offers new manual, pneumatic, and cordless guns for dispensing two-component adhesive materials

Nordson introduces a new line of manual, pneumatic, and cordless guns for dispensing two-component adhesives. The guns make dispensing even the thickest materials easier and less cumbersome. A 26:1 thrust ratio enables a lighter touch to dispense more material with each trigger pull. The dispensing guns are ergonomic, lightweight, and easy to load with a unique secured snap feature. They dispense two-component materials for applications such as injection into cracks, concrete anchoring, fixtureing, windshield installation/replacement, and bumper repair in markets such as construction, automotive aftermarket, and aerospace. www.nordsonejd.com

ACE debuts new dual pot in-line selective soldering system

ACE Production Technologies, Inc. is pleased to debut its new dual pot in-line selective soldering system that substantially increases the throughput of the selective soldering process. The new KISS-103ILDP dual pot in-line selective soldering system significantly reduces the overall process time by concurrently soldering two different printed circuit boards utilizing two separate solder pots, each equipped with their own independent X-Y-Z axis positioning system. www.ace-prottech.com

Mentor Graphics design and verification tools certified for TSMC 16nm FinFET production

Mentor Graphics Corp. announced that its IC design to silicon solution has achieved certification for TSMC’s Design Rule Manual (DRM) and SPICE model version 1.0 for its 16nm FinFET process. The certification includes tools in the Calibre® physical verification and design-for-manufacturing (DFM) platform, as well as the Olympus-Soc™ place and route system, the Pyxis™ custom IC design platform, and Eldo® SPICE simulator. Mentor also successfully demonstrated a complete 16nm FinFET digital flow using the Olympus-SoC and Calibre products and the ARM® Cortex®-A15 MPCore processor as the validation vehicle. www.mentor.com

SUSS MicroTec launches the new Mask Aligner MA12

SUSS MicroTec has launched the Mask Aligner MA12. This semi-automated tool is designed for industrial research and production of wafers up to 300 mm and 300x300 mm square substrates. It represents the latest mask aligner technology in terms of accuracy, optical performance and versatility. The operator assisted MA12 offers highest process flexibility including submicron alignment and features the MO Exposure Optics of SUSS MicroTec, a unique illumination optics, adjustable to meet various exposure requirements. www.suss.com

Seika Machinery now offers UNITECH UC-250M-CV PCB board cleaner

Seika Machinery, Inc., now distributes the UNITECH UC-250M-CV PCB Board Cleaner. The new UC-250M-CV takes all the features of the UC-250M and adds a dual cleaning feature using a combination of a brush roller with the silicone/adsive cleaning rollers. The combination dual dust removal system ensures better results than a single brush or adhesive roller system. Like the UC-250M, the UC-250M-CV has the ability to clean the top surface of PCBs, even chip components attached on the bottom side. www.seikausa.com

Fabrico offers specialty labeling services for serialization and bar coding

Fabrico now offers specialty labeling services for serialization and bar coding. Manufacturers add labels with bar codes and serial numbers to their products to make their inventory control more accurate and efficient. Fabrico's skilled design engineers can help select the best label materials, converting methods, and application processes to ensure the numbers and codes are durable and remain machine readable. These labels can be printed and applied to electrical machinery, electronics, engines, transformers, appliances, aerosol cans, solar modules, batteries, medical devices, and more. www.fabrico.com

Indium10.1 Pb-free solder paste provides lowest voiding levels for large ground planes

Indium Corporation's Indium10.1 Solder Paste is a Pb-free halogen-containing solder paste with the lowest levels of voiding for QFNs, BGAs, and pads with large ground planes. The oxidation-inhibiting properties of Indium10.1 promote industry-leading lead-in-pillow and grasping resistance, with complete coalescence, even after long reflow profiles. The exceptional soldering ability of Indium10.1 makes it the best solution for components with less-than-ideal solderability and challenging RF shield metallizations. www.indium.com

GOEPEL electronic extends IEEE1445 Interface for connection to board level simulation

GOEPEL electronic announces the further development of its special tool series for the test of complex circuitry functions within the frame of the Boundary Scan software platform SYSTEM CASCON™. The advanced tools were developed in cooperation with Selex ES. The tools enable direct coupling of SYSTEM CASCON to CAE environments. Concurrently, the import of DTIF vectors and timing sets provides opportunities to execute deterministic dynamic functional tests on board level and combine them with other procedures such as Boundary Scan (IEEE 1149.x) or in-system programming. www.goepel.com
North American semiconductor equipment industry posts March 2014 book-to-bill ratio of 1.06

North America-based manufacturers of semiconductor equipment posted $1.28 billion in orders worldwide in March 2014 (three-month average basis) and a book-to-bill ratio of 1.06, according to the March EMDS Book-to-Bill Report published today by SEMI. A book-to-bill of 1.06 means that $106 worth of orders were received for every $100 of product billed for the month.

According to SEMI, the three-month average of worldwide bookings in March 2014 was $1.28 billion. The bookings figure is 1.2 percent lower than the final February 2014 level of $1.30 billion, and is 16.1 percent higher than the March 2013 order level of $1.10 billion.

The three-month average of worldwide billings in March 2014 was $1.21 billion. The billings figure is 5.9 percent lower than the final February 2014 level of $1.29 billion, and is 22.3 percent higher than the March 2013 billings level of $991.0 million.

“Bookings levels for North American semiconductor equipment have remained consistent over the last few reports,” said Denny McGuirk, president and CEO of SEMI. “We look to the months ahead for signs of any inflection.” www.semi.org

SMTA announces Pan Pacific Symposium call for papers

The Surface Mount Technology Association (SMTA) has issued a call for papers for the 2014 Pan Pacific Microelectronics Symposium, which will be held 3–5 February 2015 on Kauai, Hawaii. The symposium focuses on the critical business markets and technologies of microelectronic packaging, interconnection, micro-systems technology and assembly.

The deadline for abstracts is June 16, 2014. Papers should be 6–10 pages, including graphics, and should offer non-commercial research results on any of the topics listed below:

- New Manufacturing Paradigms
- 3D Thermal Management
- Interposer Assembly
- 3D/TSV & Heterogeneous Integration
- Connection Taxonomy
- Embedded Assembly
- Green Electronics Materials & Processes
- Manufacturing Process Control
- Nano-Tech in Electronics Systems
- Power Electronics
- Prognostics & Health Management
- Integrated Simulation & Modeling
- Medical Systems
- Roadmaps & Industry Trends
- Eco Design in Electronics
- Reliability & Failure Analysis

Submit abstracts of 500 words with title and author contact information to JoAnn Stromberg, joann@smta.org, or online at smta.org/panpac/call_for_papers.cfm

Harsh Environments Seminar: Electronic Assembly Performance above 200°C

SMART Group will hold a seminar on harsh environments at NPL, Teddington, starting at 10:00 am Wednesday 2nd July. Registration and coffee will be available from 9:30 am.

Increasingly there is a requirement for down-hole deep sea oil applications and future engine control systems to operate in harsh environments, including temperatures in excess of 200°C. Operating under these harsh conditions will permit new applications, and improve the accuracy and control achieved by the electronic systems. As the high lead alloys potentially lose their RoHS application exemptions new technologies are being considered, and include sintered silvers, transient liquid phase solders, and high temperature conducting resin systems. In addition, high temperature coatings are being developed to protect and extend lifetime.

The seminar will feature full technical presentations and the problems faced in industry:

- Why do we want to go to high temperatures and what do we need to do to get there: Sue Knight, STI
- Solving the laminate question: Alun Morgan, Isola
- Solving the Interconnect challenge: Chris Hunt, NPL
- High temperature interconnect material: Richard Boyle, Henkel
- Change in test regimes for Harsh Environments: David Greenman, Humiseal Europe
- Materials integration, making it work: Ian Fox, AEC

More information can be found at www.smartgroup.org or contact Paula Mulla, 0208432741, info@smartgroup.org

New IPC DVD provides training on detecting counterfeit components

IPC’s new training video, DVD-166C, “Counterfeit Components” explains not only how counterfeit components find their way into the supply chain, but more important, how to detect fraudulent devices during visual inspection.

Counterfeit components are an increasing challenge for the electronics industry and a potentially life-threatening issue in military, aerospace and medical electronics. “Even the best visual inspection only catches about 80 percent of all counterfeit components. The remaining 20 percent will escape detection and when you’re dealing with substandard or counterfeit components, 20 percent is not a good number,” said Dave Torp, IPC vice president of standards and technology. “IPC’s volunteer member community has created an essential ingredient for detection and prevention of counterfeit components – and that is training.”

Companies now have a resource to help train their stockroom, production and inspection technicians on common visual indicators of counterfeit and substandard components and to effectively utilize more sophisticated detection methods such as scanning electron microscopes and X-ray fluorescent spectroscopy systems.

Available on standard definition DVD in wide-screen format or Blu-ray in hi-definition, DVD-166C, “Counterfeit Components,” can be purchased from the IPC Online Store. The standard definition DVD is $495 for IPC members and $595 for nonmembers. The Blu-ray is $545 for members and $645 for nonmembers. Online video training is also available. www.ipc.org/DVD-166C
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Sonoscan’s new automated FACTS2 DF2400™

The DF2400 is the newest generation Fast Automated C-SAM® Tray Scanning System (FACTS2™) from Sonoscan. Increased throughput, flexible configurations and the latest software options make the DF2400 the perfect solution for in-line, fully automated acoustic inspection. By using two transducers and two simultaneous scanning stages throughput is doubled. The DF2400 is programmed to scan only the regions of interest on a tray instead of scanning the entire tray area.

www.sonoscan.com

Aeroflex LTE base station RF measurement option available for PXI 3000 modular platform

Aeroflex Limited has announced the separate availability of the LTE Downlink Measurement Suite, a suite of software tools that works with the Aeroflex PXI 3000 platform to characterize the transmitter and receiver parameters of LTE base stations (eNodeB) and small cells in production test. www.aeroflex.com

Engineered Material Systems Debuts DF-4017 Hydrophobic Dry Film Negative Photoresist

Engineered Material Systems, Inc’s DF-4017 Dry Film Negative Photoresist for use in micro-electromechanical systems (MEMS) has been optimized for hot roll lamination and processing on MEMS and IC wafers. DF-4017 film was developed to produce extremely hydrophobic (>90° contact angle) film surfaces. The cured chemistry can withstand harsh environments including resistance to extreme moisture conditions and corrosive chemicals. www.emsadhesives.com

Techspray introduces Fine-L-Kote high viscosity AR conformal coating

Techspray expands their conformal coating offering with Fine-L-Kote High Viscosity AR. This new product is now a part of Techspray’s Fine-L-Kote line. Fine-L-Kote High Viscosity AR (part #2151) is an innovative acrylic conformal coating that gives PCB assemblers a wider process window and greater flexibility in their coating operation. High viscosity allows operators to use as-is for dipping, or to thin down for spray systems. Either 2105 or 2110 Techspray Conformal Coating Thinners are able available to reduce the viscosity to fit ideal process parameters. www.techspray.com

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