Press Release

Viscom Technology Forum and User Meeting 2015: Fit for inspection and process control

Hanover, March 2015 – **The Viscom Technology Forum and User Meeting once again had lots to offer this year: user reports on experiences of the inspection systems in practice, interesting specialist presentations, free workshops, and live demonstrations. Viscom sales engineer Michael Mügge chaired the event with his usual expertise and charm. But to start things off, the participants drove 10,000 kilometers through the desert – without getting any sand in their shoes.**

“Great things often start off as dreams. The power of these dreams is what helps you to overcome the challenges,” said Jutta Kleinschmidt. And as her exciting report made all too clear, challenges were not in short supply. The rally driver and physics graduate is one of the world's most successful women in racing. She is not only the first – and so far only – woman to win the toughest rally in the world, the Dakar Rally, in the overall ranking: she was also the first German to appear on the winners' podium.

In her presentation, she took the audience with her on a fascinating journey through rally driving – from her first motorcycle tours and following the Paris-Dakar Rally through to having her own works team. The presentation included excellent photos from all stages of her career and lots of interesting details about the racing circuit. She demonstrated impressively that setbacks do not mean you have to give up on your dreams – quite the opposite: with perseverance, hard work, and intelligence, you can learn from your own mistakes and win through in the end. The message of her keynote speech was that if you trust yourself and your team, you can take risks in order to achieve success. The audience was very impressed by this likeable sportswoman.

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User reports: Reduced costs with multiline verification and quality control for high components

The Viscom multiline verification concept resulted in a huge cost reduction and brought about a sustainable increase in efficiency in the AOI process. That was the conclusion of Jens Herbert from Continental Automotive GmbH. In his user report – “Viscom multiline verification concept as a success factor – the path to visual management and cost optimization” – he explained the idea and its successful implementation, which has optimized the classification of the inspection results.

The basic parameters of the multiline verification concept in electronics manufacturing at Continental Automotive are DPMO (real defects), pseudo defects, process improvements, and cost reductions. The customer requirements specify that no defective goods must be supplied and there must be no repairs, while the quality requirements include the continual reduction of pseudo defects and an increase in FPY.

The pilot project should furnish evidence that, under certain clear-cut and easily describable boundary conditions, it is possible to harmonize standards for optical inspection systems (AOI) such as inspection quality and inspection depth, at any time. The standard line concept stipulated that there should be a verification station with an operator in every line. The specific case therefore required three verification stations with three operators for three SMT lines. In his presentation, Jens Herbert demonstrated impressively that the concept of multiline verification optimized this line concept at Continental Automotive to such an extent that only one verification station was required for three lines. This means that the results from all three lines can be classified by just one operator via remote control. The concept was implemented in collaboration with the experts from Viscom.

The speaker also summarized the most important results of the approved visual management project: it has been accepted by the workforce; there are no negative changes with regard to the quality indicators; there are no

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additional personnel costs; no new investments are required, and there is no need for any changes to the MES connection. Implementation of every combination of AOI/transport is possible. Printed circuit board handling on the line has been reduced and simple fault messages are signaled to the operator via color assignment.

Dietmar Bohn from Hekatron Technik GmbH, an EMS provider from the Securitas Group in Switzerland, spoke about his experiences with high components in his user report. The starting point was the issue which arose with an electronic assembly for a smoke detector with a high alarm device: with a maximum stencil thickness of 130 µm, there were approx. 3 % non-soldered connections. The aim was to eliminate failures due to non-soldered connections in the final test. This had to take into account the casting of shadows and the covering of components by the alarm device. Instead of a separate visual inspection of the soldered connections with resoldering, the alternative AOI check was tested with 8 angled view modules and resoldering in the process. Two of the four component connections should be switched in parallel.
Dietmar Bohn showed how Hekatron was able to decrease process times by 75 % of the initial value thanks to the introduction of AOI with angled view cameras. This was accompanied by a quality improvement of 99 % to less than one hundredth of the failures. For one component with a defect rate of 3 % due to its manufacturing process, the rate was lowered to 0.04 ppm. The first pass yield of final devices also improved significantly, meaning fewer non-repairable defects.

3D SPI process control and yield improvement

The presentation by Jacques L'Heureux, Viscom sales engineer from the US subsidiary, and Detlef Beer, who is responsible for AOI assembly inspection product development at Viscom, focused on the practical side of 3D solder paste inspection.
Their starting point was the fact that 60 – 70 % of the defects in SMT production result from paste printing. Jacques L'Heureux's question

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regarding SPI was as follows: should the SPI system wait for the operator to retrieve, sort, and interpret the information, or should the SPI send the relevant process information to anyone who needs it in real time? Surely those responsible for production would favor the latter solution. And far from being a mere pipe dream, the presentation – supplemented with lots of examples – showed that this can be achieved with intelligent integration of the SPI into the process.

The first key result of the 3D SPI was of course the large amount of detailed information available about the printing process. This means that, for example, a new stencil technology or a modified paste application can easily be tested beyond the defect detection. The effects of process optimizations can be established and documented. This saves costs, raises production quality, and is the ideal analysis tool for each prototype introduction and every serial production. In this way, the SPI system can also ensure improved quality, increased throughput thanks to risk-free extension of the cleaning intervals, and savings with regard to the consumable material.

Detlef Beer also used a large number of practical examples and inspection images to show how the Viscom Quality Uplink visualizes what is actually happening in the process, thus enabling effective process analysis. The intelligent software tool links the inspection results from the line. On this basis, defect concentrations can be explicitly determined and analyzed. For example, are the defects due to the printed circuit board design, or a component thermal pad? Variations or inaccuracies in classification can be corrected (e.g., tombstone or twisted component; contamination or solder bridge).

However, the Quality Uplink also offers another major advantage: it supplies verified defect limits for the SPI system. With this knowledge, the warning and classification thresholds can be ideally set so the first pass yield rises on the SPI, the "end of line" defects drop, and reliability of the electronic assemblies is increased.

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Specialist presentations and out-of-the-box thinking

Prof. Dr. Christian Faber, from the University of Applied Sciences in Landshut, chose the intriguing title “Optics, color, and information – from inspection system to black hole” for his presentation. The topics of illumination optics, imaging optics, and information theory are of central importance for an optical inspection system, but for users they usually seem abstract and difficult to grasp. In keeping with the nature of his presentation title, Prof. Faber understood how to make this important material interesting and extremely entertaining, and he explained the essential background information clearly and comprehensibly. His question was: How can we get the best out of the available technology or, looking at it the other way round, which areas are worth investing in?

After presenting light as a scanning tool and a medium for transferring information, e.g., for an inspection system, he spoke about the importance of illumination and imaging optics and their different roles. In relation to imaging optics, he used various examples to illustrate the impact of the aperture and focal distance on perspective, and the difference between a conventional camera and a Scheimpflug camera when it comes to angled views. The central point of his speech, however, was the importance of illumination in an optical inspection, as it is used to encode information – when illumination is chosen well, the technical conditions and limitations of a sensor (pixel resolution, frame rate) can be utilized to optimum effect.

He then spoke about the use of the spectral properties of the light field for transferring information. In an automatic optical inspection, color is an additional modality for coding information. Current practice involves using spectral broadband light sources with color cameras, but this does result in a loss of resolution (Bayer filter). Spectrally coded illumination is a useful alternative in this case. Ultimately, one thing was clear: illumination is the central factor which makes it possible to identify certain characteristics in the best and most efficient way with regard to information. It also became clear that common terms such as “color space” or “color stimulus specification” merely describe physiological variables, which in most cases

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are not relevant to an AOI (the only exception being the verification station operated by a person). In order to utilize the channel capacity of a sensor to the best possible extent, color should be regarded purely as a spectrally coded additional modality.
At the end of his presentation, Professor Faber was able to make the surprising link to black holes, as promised in the title: the event horizon of a black hole is an “object” of maximum information density – so simple questions about maximizing the information efficiency of an AOI sensor can actually lead to fundamental topics of current cosmological debate (keyword: “holographic principle”). And on that inspiring note, Prof. Faber ended his very entertaining presentation.

Stefan Härter, Chair for Factory Automation and Production Systems (FAPS) at the University of Erlangen-Nuremberg, dedicated himself to evaluating the self-centering effect of 01005 components using AOI. In a practical test, which was carried out as part of the AIF research project “01005 process window”, he studied how 01005 components behave in production. Detlef Beer from Viscom AG supported this study by contributing the measuring and inspection results that were recorded with the AOI S3088 *ultra*.
The self-centering effect describes the floating behavior of the components, which realign themselves during the reflow solder process using the surface tension of the solder.

The speaker highlighted three key aspects in conclusion: firstly, although the optical appearance of 01005 components places high demands on the automatic optical inspection, the AOI system demonstrated the necessary stability, measuring equipment capability, and reproducibility. Secondly, the occurrence of tombstone effects is evident with this test setup. Capacitors have a higher tendency toward the tombstone effect, with most tombstones caused by horizontal displacement and twisted components. The pad design and the solder paste have a significant impact on the process result. Thirdly, resistors demonstrate better floating behavior, whereby the pad

design has the greatest impact. Comprehensive evaluation of the effects on self-centering requires a detailed analysis of the production parameters. The pad layout for the 01005 components is always a compromise because so many influencing factors need to be taken into account.
“But the next miniaturization steps are imminent,” said Härter, concluding that “it is worth getting to grips with the processes”.

As always, the Viscom User Meeting took place in parallel to the presentations in the Forum. Once again this year, the participants had the opportunity to find out about the inspection systems in numerous free workshops. There were also plenty of chances to exchange ideas and information: participants were able to share experiences among themselves and with Viscom employees, and take away valuable suggestions and tips from the experts.

To kick off the traditional evening get-together, Peter Krippner (Senior Vice President at Viscom), Dirk Nülle (Head of SP Product Development), and Rolf Demitz (vice president for the new products business unit) presented the applications and advantages of X-ray inspection in a live demonstration with the X7056 (AXI) and X8068 (MXI) systems. They used live applications to show the key advantages and uses of both systems.
Notable highlights of manual X-ray inspection with the X8068 include the extremely high image quality, the high resolution, and the manipulation of the inspection object with 5 axes. In addition to manual inspection, they also highlighted the possibility of semi-automatic inspection, which makes the inspection process even more convenient. And the inspection of large boards up to 600 mm x 400 mm must not be forgotten either. The application areas for the system are primarily in the field of fast, powerful random sample analysis and automated, hassle-free series inspection of larger printed circuit board panels.

The X7056, on the other hand, is a fully automated in-line system for automated X-ray inspection (AXI). The key features of the X7056 include

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the flexible configuration options of the flat panel equipment, the first-class image quality, and the fast throughput – clearly demonstrated in the live presentation with the help of different practical examples. For a combined AXI/AOI inspection, the inspection system can also be assembled with an AOI unit and the high-performance module XM 3D. With these features, Viscom offers a one-of-a-kind inspection concept and the optimum X-ray inspection for high-end applications: 3D square.

Henning Obloch, vice president business unit service, then spoke about the advantages and practicalities of the XM upgrade. It updates older systems to the current hardware status for the camera technology and thus to the most up-to-date level of performance. His presentation made it clear that the upgrade can rapidly boost efficiency and reduce inspection times hugely. Just in compatibility mode, a clear gain is achieved in these areas.

After 6 p.m., there was time for a bit of relaxing. With live music from the jazz/pop band “The Ellingtons”, cold drinks, and delicious food from the buffet, there was ample opportunity to continue discussions from earlier or just to chat for a while. Later on, there was more entertainment in the shape of the two “Musichanics” from Auto-di-Takt – with a mind-boggling array of automobile instruments of their own devising, they treated the audience to a first-class musical pit stop. Whether it is an exhaust pipe didgeridoo, hubcap drum, or clarituba, the two musicians seem to be able to make an instrument out of even the most unassuming car part, and the performance went down a storm.

Image caption: Dirk Nülle, Head of Viscom SP Product Development, presents 3D X-ray inspection.

About Viscom
Viscom AG develops, manufactures and sells high-quality inspection systems. The portfolio encompasses the complete bandwidth of optical and X-ray inspections. In the area of assembly inspection for electronics manufacturing, the company is among the leading suppliers worldwide. Viscom systems can be configured specific to the customer and can be interlinked. The company headquarters and manufacturing location is in Hanover, Germany. With a wide network of branches,

applications centers, service support points and representatives, Viscom is represented internationally. Founded in 1984, since 2006 Viscom has been listed on the Frankfurt Stock Exchange (ISIN: DE0007846867). For additional information: www.viscom.com

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