Semi-automatic repair at EMS

Vision required

High quality, highly complex boards with high pin count ICs, SMDs mounted on two sides and that for pad rasters of 0.5 mm including QFNs and BGAs – using what and how this is repaired is considered very carefully.

We are talking of piece counts of 100 up to batches of a few thousand per year. When and how is an expensive repair process for such boards worthwhile?
Zollner Elektronik in Zandt has learned from experience and decided to remove complex repair tasks from the numerous production lines and perform them at a separate
workplace – with corresponding professional equipment.
The majority are BGAs of many different variants which have to be desoldered here, replaced and then precisely soldered in again. A clear repair order from the respective inspection station including all relevant data goes in advance. This can be a defective solder point which has been discovered during the automatic X-ray inspection such as, e.g. too many voids or components detected as defective during the AOI or such which have failed during the electrical test.
In the case of an assembly with a 32-layer circuit board and approx. 20,000 solder points (photo 1), it is obvious that a repair is also worthwhile: even if an error rate of 5 to 10 ppm is calculated, hardly any board can really be 100% error-free. After all, it is a matter of batch sizes of “only” a few hundred, i.e. boards where such a highly stable process as for tens of thousands cannot be expected right from the start.

Repair in focus

“In the meantime, we have had a continuous association with Zevac already for more than 10 years”,

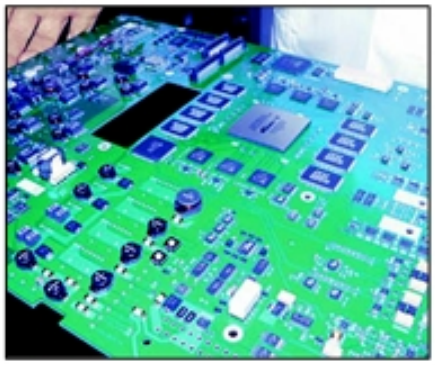

Photo 1: Highly complex, high value board

explains Ulrich Niklas (photo 2). "We purchased the first machine, a DRS 22 in 1996 and later several DRS 24 and also constantly further developed the partnership with Zevac afterwards for repair solutions. These machines are still being used. However, we had to convert last year for several reasons to an Onyx 29 (photo 3) which best meets our requirements today and for the foreseeable future”.
A component which is already rather difficult to process at first glance is, for example a high pin count SMD plug connector (photo 4) which is in fact supplied with an additional solder deposit

Photo 2: Ulrich Niklas, Production and Test Technology PT Manager (right), Zollner Elektronik AG, in Zandt and Philipp Schreckinger

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ABOUT ZOLLNER ELEKTRONIK

Zollner Elektronik AG is one of the Top 15 EMS companies in the world – however still in family ownership and without its own products, participations etc. The focus is on the Bayerischer Wald location with
a total of 8 production facilities. There are other subsidiary plants in Hungary, Romania, China and Tunisia as the newest
location. Apart from electronics, customer-specific inductances, plastic and sheet metal cases
as well as complete devices and systems are also still produced completely as the customer requires. Of the more than 6,900 employees, more than one hundred developers are involved with customer-specific solutions for everything concerning electronics.

Many customers from the rail, medical technology and also from the automotive sector are forcing Zollner to double track working: More than half the orders still concern electronics containing lead. Numerous completely automatic lines and also lean production islands for unavoidable manual activities require competent employees. Therefore, a lot of importance is also placed on in-house training and further training. In the meantime, Zollner has been able to discharge more than 1,000 trainees into professional life with the majority in its own subsidiaries. In 2007 alone, there were 85 new trainees; currently 82 trainees are starting again at Zollner Elektronik AG.

on the respective blunt pins and therefore also comes like a BGA, however must withstand significantly more on the final product board. "Such a component can no longer be repaired at all manually - and also not with a simple repair machine", explains Ulrich Niklas. "The complexity alone to bring the heat – 100 to 120 °C and even higher for lead-free – evenly into the board for 400 balls requires a sophisticated bottom heater.
Then of course there is also the precision soldering in again. The plastic of the plug connector must never be overheated during the soldering in".
The heating of this 32-layer board from underneath happens very quickly, namely less than one minute. Otherwise the procedure is similar to soldering in again in a standard reflow process. Another benefit for the Onyx 29 system: Similarly to a camera, the temperature is constantly monitored using a laser temperature measuring system (photo 5). In doing so, the machine can perform an automatic profile or the reflow process can be coupled with the measurement results of the temperature sensor.
The high placement accuracy also creates benefits, mainly because the alignment of the component to the board must still always happen optically, i.e. is dependent on the expertise of the employee, as is now usual for semi-automatic machines. Even if the completely automatic Onyx 32 were used, the process expertise of the operating person is always an important matter.
The desoldering process is also convenient if you would like to desolder several components one after the other on a board. If all data are saved, such a process runs completely automatically. "The system can be programmed so that the operator can make hardly any errors. Board layout and error location, operating instructions etc. – all this is conveniently displayed. The machine does the rest", explains Philipp Schreckinger. "The component library is also well-stocked. Even components which cannot be gripped in the middle can be reprogrammed. For every component,

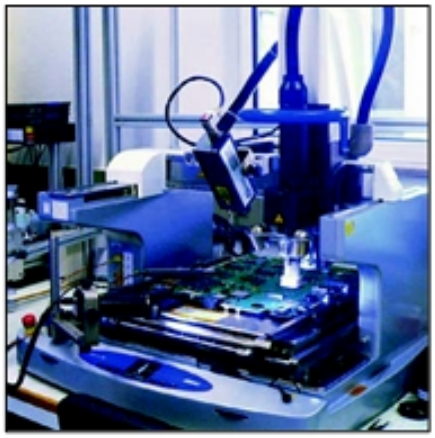

Photo 3: The Onyx 29 repair station from Zevac at Zollner in Zandt

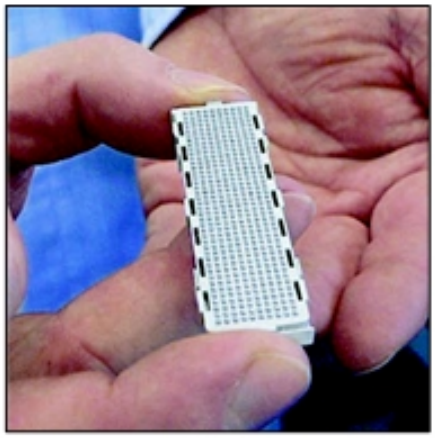

Photo 4: The challenge: SMD plug connector with 400 connectors

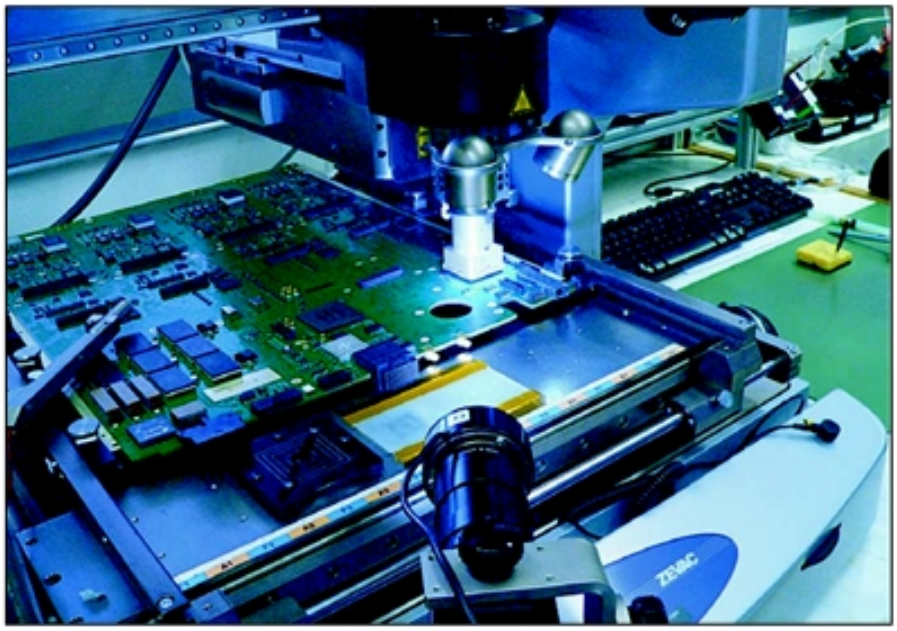

Photo 5: The working area of the Onyx 29

the corresponding nozzle types and several profile proposals are stored. Even a force measurement unit is integrated – not to mention such simple aids as the automatic detection that the component has also been supported correctly etc".

Outlook

"If someone like Zevac also continues to be right at the front technologically, then we will of course happily continue our partnership. My suppliers should always be the technology leaders", says Ulrich Niklas. "Otherwise I would have to consider in the next step how I proceed further. However, the Onyx 29 has proven itself super to date. For this reason, we have already purchased 2 more machines for subsidiary plants. We are already relying on the Onyx 29 for the selective soldering in for the sample production. After all, the initial sample should already be completely functional.
The machine should also soon be used in two-shift and later three-shift operation because several profit centres access this repair station. This also means that this machine must also prove itself under maximum operational requirements".

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