Technical article

Adhesive inspection at its best

Process control and safety for the pump print process

The print process and first pass yield are two terms which can deviate from one another strongly in practice. Statistics give clear answers here. And things don't get better if the paste print process with stainless steel templates and an open doctor blade system is replaced by the pump print process with decal printing. And if you want to top the lot, you add a closed doctor blade system of the ProFlow type. In order to get to grips with this challenge even better, the firm of Tridonic decided to use the Versaprint P1 template printer with 100% inspection from the firm of Ersa.

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Rudolf Intihar (left), Manager New Product Introduction of the firm of Tridonic, and Wolfram Hübsch, Product Manager Printing Machines Ersa GmbH

Tridonic is the technology enterprise in the Zumtobel Group and has its headquarters in Dornbirn, Austria.

Tridonic continuously places state-of-the-art innovations and light solutions on the market. 95 per cent of their research and development projects are dedicated to developing new LED systems and technologies for interlinked light.

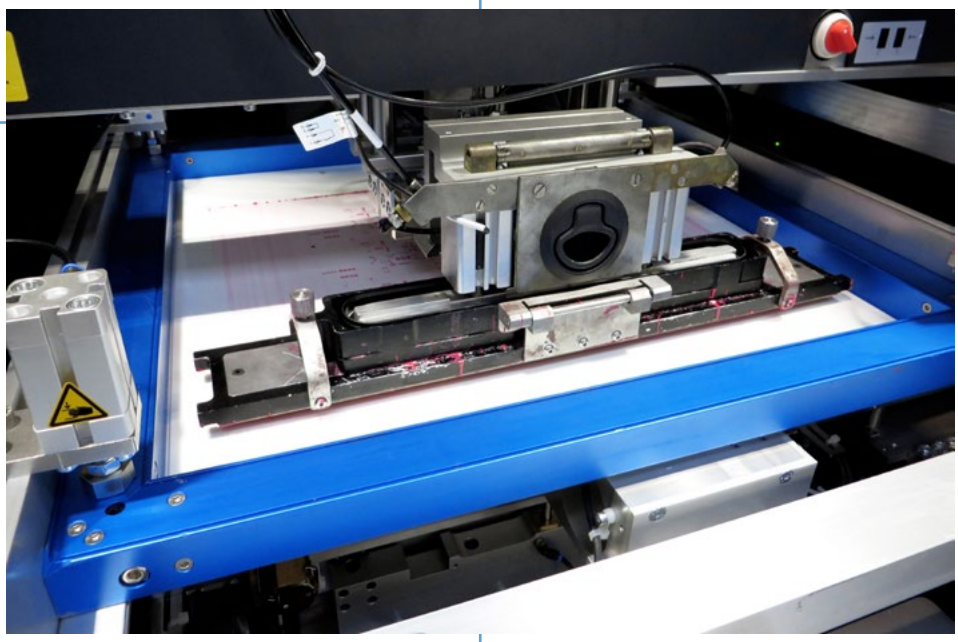
Thanks to well-founded technical knowledge and skills in the field of vertical illumination applications such as sales, hotels/catering, office and education, external applications and industry, leading light manufacturers, architects, electrical and light planners, electrical fitters and wholesalers stake on Tridonic for both internal and also external illumination. Customers appreciate Tridonic as an innovative and competent partner who makes their light more intelligent, more interesting and more lasting.

1,640 highly qualified employees and sales partners in more than 50 countries worldwide reflect the company's commitment for the development and introduction of new, intelligent and interlinked illumination systems. More than 40 million installed light points per year means that Tridonic plays a decisive role in interlinked illumination as a key element and as an important infrastructure for the "Internet of things".

Continuous innovation is probably the key for a successful company history and should be found in all the areas of an enterprise. If you stake on innovation in the development of your products and also go down new and unconventional paths, you also do not stop when it comes to producing them.

RELEVANT PROCESSES OF ELECTRONICS PRODUCTION

For the electronics production in Dornbirn, they stake on a process which is found relatively rarely. The combination of THT and SMD modules is always more difficult to handle than a purely SMD process and some plug-in contacts, which can then be worked on in the selective welding process. In order to combine these two differing processes, they decided to fit and crimp the THT modules first and then to fit the SMD modules on the other side of



ProFlow system

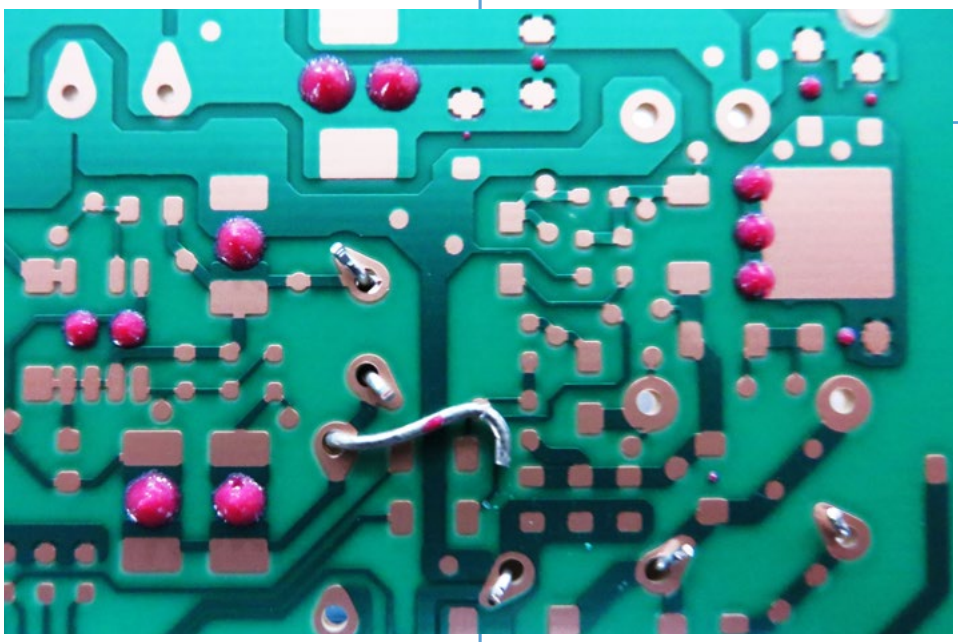
the circuit boards. The module is subsequently soldered in the wave soldering process. The challenge in this is fixing the SMD modules on the circuit board. A possibility of applying the SMD adhesive is making use of a dispensing system. But even a dispensing system with a number of dispenser heads, be it classical by means of screw dispensers or by means of jet technology, is not in a position to apply adhesive for a large number of modules in an acceptable cycle time.

So all that remains is the printing process. However, the precondition for this is ensuring a reproducible transfer of the print medium onto the module. As THT modules have already been fitted, they protrude on the side of the circuit board to be printed. This is where the pump print process comes into use. The pump print template is 3 mm thick for this application and has recesses, into which the ends of the THT modules disappear, on the contact side to the circuit board, thus making a level, even contact of the template on the circuit board possible.

The shape and size of the required adhesion points are also defined via recesses in the template, the so-called transfer channels. The challenge in this process is pushing the adhesive through this channel. When the circuit board is removed from the template, an adhesion point is formed in accordance with the recess. In the classical printing process and use of doctor blades, the blade angle and the pressure as well as speed are the determining variables. If you wish to push adhesive through a channel 3 mm in length, the main focus of attention is on the transfer power in the Z direction. There are possibilities of optimisation in the adaptation of the transfer channel in the template and the geometry and selection of material for the blade sheets.

FIXATION OF THE SMD COMPONENTS

As an alternative to classical doctor blade printing, the firm of Novatech designed a closed doctor blade head some years ago, the special point of which is a pressure chamber, by means of which the transfer power, i.e. the power in the Z direction, can be set via a pressure piston. This was precisely the process on which the firm of Tridonic decided years ago, in order to apply adhesive for fixing SMD modules on the circuit board.



Fitting error with wire not cut off. The adhesion points which have not been produced are clearly visible.

As regards the idea, the correct approach, but practice then shows some disadvantages. The biggest one must be the sealing of the circuit board towards the template and the risk which results from this, insertion of adhesive in between them if the pressure in the Z direction is too high. This is because various quantities of adhesive are needed for the individual adhesive points, but the transfer pressure does not make any distinction here. The result then shows two problems. Not enough or too much adhesive. Not enough means insufficient fixing of the SMD module for the wave soldering process and too much means the adhesion point is too big. Too much adhesive increases the risk that it is flattened when the modules are fitted and lands on the pad surface or causes threads in the separation process and likewise appears on the pad surfaces as an undesirable medium.

A further large problem is the quality and dependability of the fitted THT modules. The fitter's task is to place the modules, crimp them and cut them off at the correct length. If the ends of the wires are too long or crimped at a wrong angle, the template has no contact to the circuit board as they cannot immerse into the recesses. Or, as can be seen on the picture, the fitter has not even cut the wire off. In all cases, the outcome is the same, the template does not have any contact to the circuit board and seals off. The result is either too much medium which is pushed between the circuit board and the template or no medium at all as the contact to the circuit board has not been produced and no triggering process has taken place.

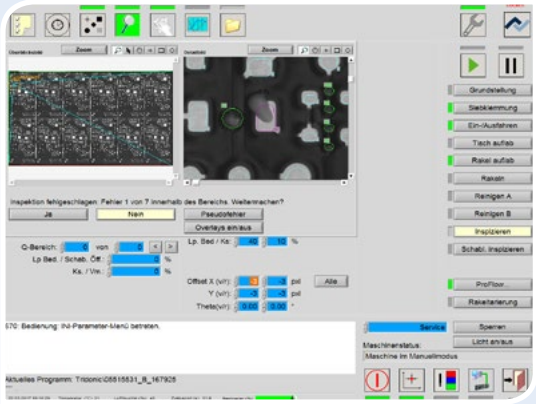
"Recognising these errors is decisive after the printing process step, as there are no more inspections in the following step and these errors are only discovered in the examination of the finished module. The consequence is often that a part of the batch has to be scrapped", says Rudolf Intihar, Manager New Product Introduction.

PRINTING PROCESS UNDER CONTROL

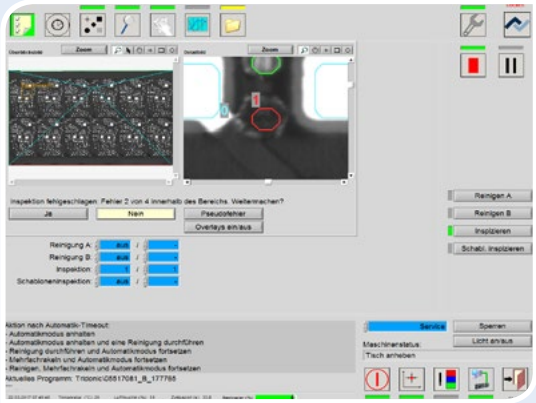
To come to terms with these problems, Tridonic made a search for a suitable inspection system in order to have better control over the printing process. Ersa appeared to be the correct partner here, as they are the only manufacturer

on the market to offer a 100% inspection in the printer. However, it was not a standard machine that was required here, but a specific solution for this application. The inspection was not only to inspect for the existence of the adhesive, but also for non-existence on the pad surfaces.

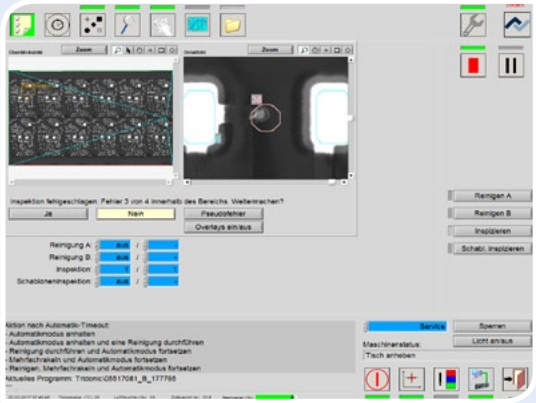
An extension of the software produced the solution. Instead of only one Gerber file which marks the adhesion points, a second Gerber file is imported and defines the pad surfaces. Now, both a minimum limit for the existence of the adhesion point and also a maximum area for the recognition of adhesive on the pad surface can be defined.



Adhesive on pad surface



Non-existence adhesion point



Incomplete adhesion point

TRIDONIC HAS DECIDED TO USE THE VERSAPRINT P1

The P1 is currently the only template printer on the market with an integrated 100% print post-control. Through the use of a line camera instead of the surface cameras which are customary otherwise, a clearly faster detection of the entire circuit board becomes possible, which is the foundation for a full-surface inspection. The line camera thus makes both positioning of the circuit board for the printing process and also the parallel inspection of the entire layout possible. The parallel sequence is the second special point about the VERSAPRINT P1. The arrangement of the camera axis and the use of three-part transport makes optimisation of the entire sequence possible. The so-called idle time, standstill time of the machine, is greatly reduced by the two longest process steps, the printing process and the inspection, taking place parallel. ■

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