STENCIL PRODUCTION FOR PRECISION SCREEN PRINTING

Increasing demand for screen-printed electronics with minute structures requires highly accurate, repeatable exposure. Urs Bachofner explains how CTS technology can ensure stable, precise and consistent screen production

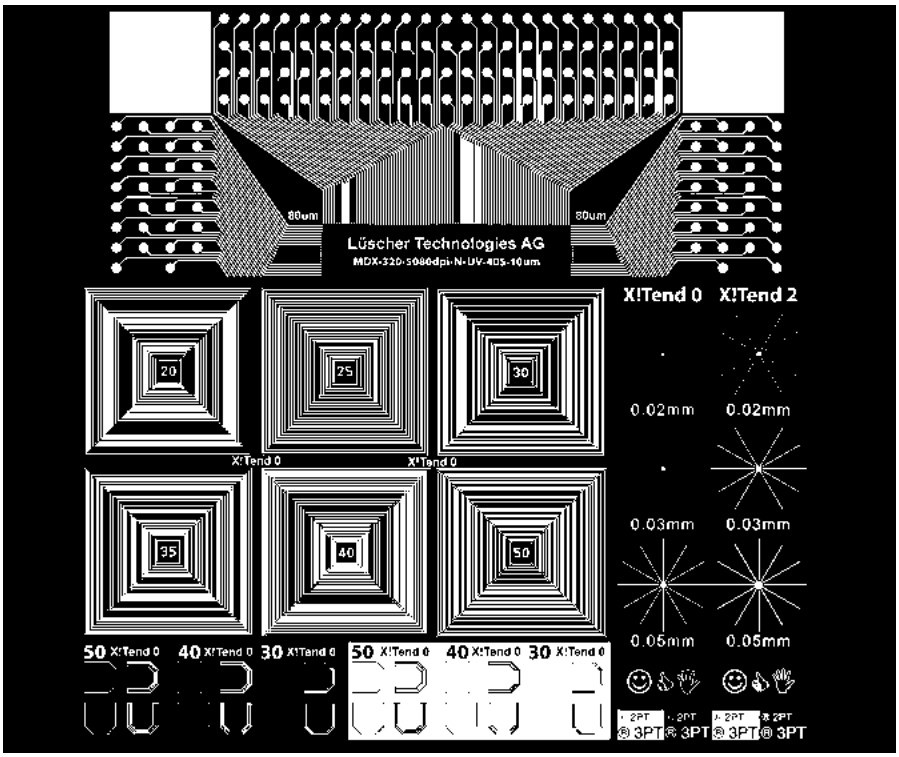
Urs Bachofner is Senior Vice President of Business Development at Lüscher Technologies

Requirements and developments in precision screen printing have changed greatly in recent years. Steady progress has been made in the further development of fabrics, emulsions, printing pastes and printing machines. At the same time, the demands of the printed electronics market have become more challenging.

The resolution of printed structures has taken on a key role: structure sizes of 20 microns and smaller are requested, which can be realised today with the appropriate screen manufacturing process. Screen printing for the production of sensors, printed circuits, RFID antennas, printed batteries and many other applications will become even more important in the future.

"Printed structure sizes of 20 microns and smaller are difficult to achieve via conventional exposure with film and vacuum exposure unit"

Structure sizes of 20 microns and smaller require not only a corresponding emulsion suitable for high resolutions, but also an extremely precise and repeatable exposure. This can be very difficult to achieve via conventional exposure with a film and vacuum exposure unit, as underexposure, vacuum inclusions etc. make clean exposures difficult if not impossible. With computer-to-screen (CTS) technology, these process uncertainties can be bypassed to ensure a stable, precise and repeatable screen production.



Test file for high resolution screen printing

PRODUCING STENCILS USING LASER DIODES

There are various methods for producing screen stencils; here I will focus on the technology of Lüscher Technologies. Compared to other methods, Lüscher applies fibre-coupled laser diodes in the UV range (405nm or 375nm wavelength). These laser diodes are extremely durable and have a service life of over 20,000 exposure hours. Up to 128 laser diodes can be combined in an array. The number of laser diodes gives the exposure speed. For the optics, in which the individual fibres are combined, various resolutions can be selected depending on the required quality. Resolutions up to 10,160dpi are possible, which corresponds to an exposure beam of 2.5 microns. So-called multi-resolution optics with two resolutions each, such as 5080 and 10,160 dpi, are also feasible. They can be used to define the resolution as required and thus the optimum quality and speed ratio of the exposure can be determined by the user.

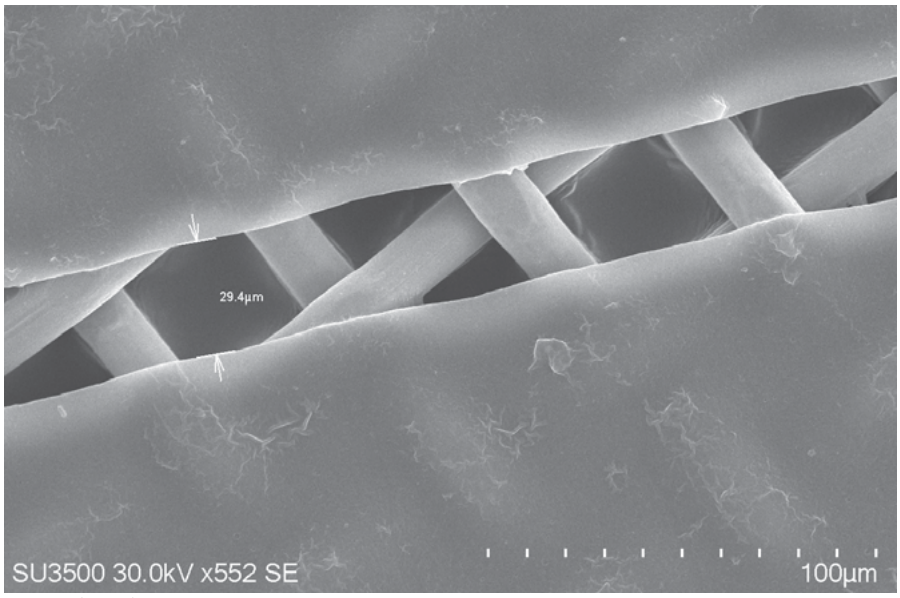
The energy output of the laser diodes is high enough to harden even thick layers with sharp edges and thus achieve stable printing results. The pick-up table for the stencils can be equipped with the register system of the existing press on request. This significantly reduces makeready times and waste.

CTS SYSTEMS FROM LÜSCHER

All CTS systems made by Lüscher are modular in design and can be adapted to meet changing conditions as needed. Laser diodes can be retrofitted on site if a higher production speed is required.

"The energy output of the laser diodes is high enough to harden even thick layers with sharp edges"

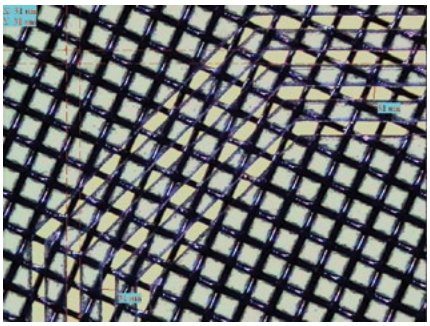
To support users, Lüscher has developed a software tool that allows direct intervention in the exposure data. Depending on the degree of reaction of the emulsion when printing the finest structures, partial editing of the data may be effected. The software resizes all graphic elements to compensate for light diffusion, diffraction and other physical phenomena to bring them in line with the TIFF input.



30-micron line under a SEM microscope

Lüscher's XTend! software is user-friendly, runs during the exposure and therefore has no impact whatsoever on the productivity of the machine. It has been proven in production by well-known customers in the printed electronics industry.

Quite often, I am asked the question as to when the investment in a CTS system is worthwhile. I hesitate to give a general statement in this regard, because provided an investment in a CTS system increases quality, process reliability and thus customer benefit, this is not directly expressible in 'facts and figures'. However, a satisfied and perhaps even enlarged clientele will certainly have a positive effect on the business figures at the end of the year. To provide a possible answer to this question, Lüscher has developed a ROI (return on investment) calculator that is very specific on the customer's particular needs and can provide some important clues about the cost-effectiveness of a CTS system. This tool is made available to interested customers free of charge. ■


30-micron line on steel mesh

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