ELECTRIC AVENUE

Electronic manufacturing is opening up new opportunities for screen printers. Dr. Moazzam Ali discusses his aim to demystify and democratise modern technologies that can be produced on standard screen printing machinery

In electronic manufacturing, screen printing is a well-known process. It is extensively used for the production of printed circuit boards (PCB) – the 'base' of all electronic devices. Screen printing is also used for the production of membrane switches, which are present in our household electrical and electronic equipment.

Although screen printing has been commonly used in electronic manufacturing for decades, the printing know-how still belong to an exclusive club of a selected few companies. For traditional screen printers – who are experts of printing techniques, more specifically colour printing – entry into the club is very difficult. This difficulty arises due to extensive use of non-printing production processes in electronic manufacturing. Compared to non-printing production processes, the contribution of screen printing to the complete manufacturing process is very small.

NEW OPPORTUNITIES – AND CHALLENGES

A new technology called printed electronics is emerging in the field of electronics. Through this technology electronic devices can be produced solely by printing techniques. Currently, printed electronics is done by screen printing, inkjet, flexo and rotogravure techniques. Screen printing has an advantage over other printing techniques because it is a low-cost process with a substantial printing speed. That means a new opportunity is appearing for traditional screen printers in the field of electronic manufacturing.

However the entry of traditional screen printers into this new market is not free from barriers, as the technology is still in its nascent stage. The first barrier is related to production know-how of printed electronics, which mainly belongs to a handful of companies who keep it as their trade secrets. That means production know-how is not easily available for printers.

The second barrier arises due to the unavailability of all necessary inks needed for printed electronics. In order to produce printed electronics, a printing company needs access to all the necessary inks and these inks must be compatible to each other. Presently, different inks are manufactured by different companies and as expected these inks are not compatible to each other. Complication increases when the commercially available inks are not suitable for an existing printing setup of a printing company. That means a printing company needs to test different inks from different suppliers to identify a set of suitable inks. Somehow, if the printing company manages to solve ink-related issues, it has to do extensive R&D to develop products by using these inks. These barriers are keeping screen printing companies away from printed electronics.

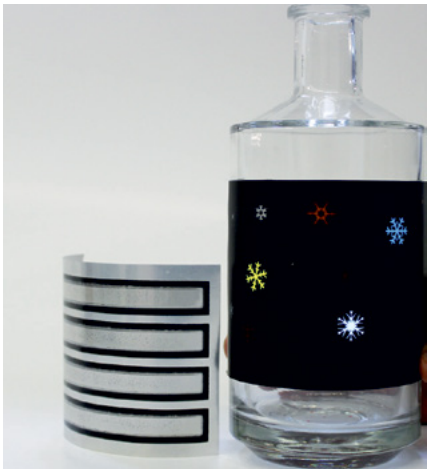


Figure 1: OLEDs powered by a thin and flexible printed battery for a bottle label

"Saralon has simplified the production of batteries by converting battery materials into inks and printing these inks into a form of thin battery"

LOWERING THE BARRIERS WITH INKTECH BY SARALON

Saralon GmbH, a start-up from Technical University of Chemnitz, has taken up the challenge of lowering these barriers and bringing traditional screen printers into the field of printed electronics. The company not only sells all necessary inks but also provides complete production know-how of printed electronics.

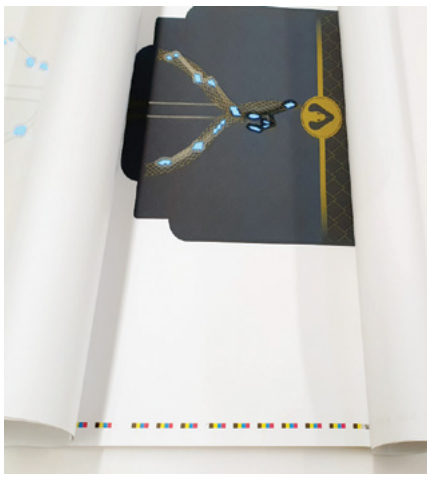
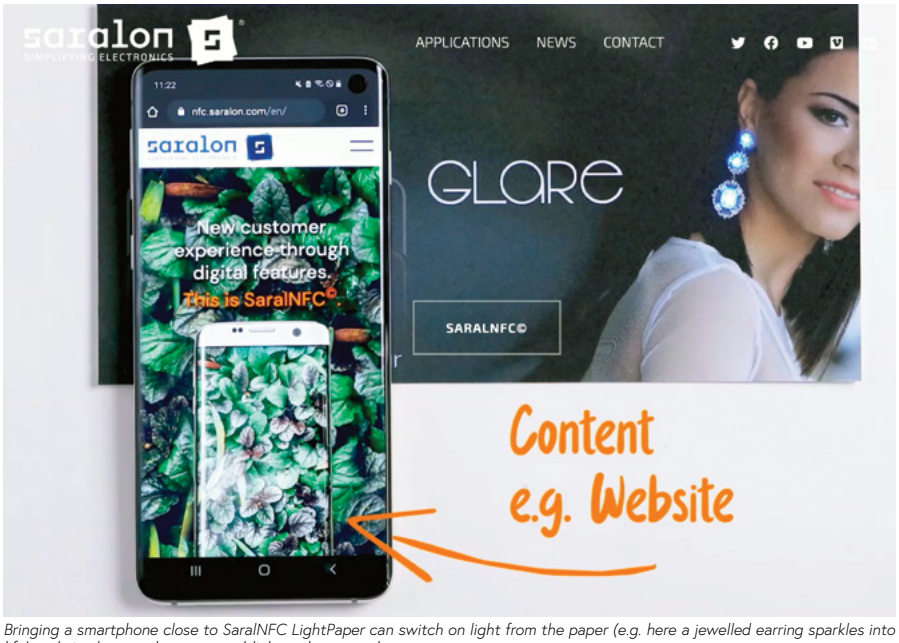


Figure 2: Saralon's latest development in the field of Electroluminescent technology: printed 'light' on paper



Bringing a smartphone close to SaralNFC LightPaper can switch on light from the paper (e.g. here a jewelled earring sparkles into life) and simultaneously open a weblink on the smartphone

Saralon was founded in 2015 with the aim of bringing printed electronics to traditional colour printing companies. Keeping the needs of colour printing companies in mind, the company has developed multiple compatible inks for various printed electronic applications.

Apart from selling inks, Saralon provides production-related training to printing companies to help them produce printed electronic applications. As Saralon has full control over ink development and its production, it can easily adjust its inks according to a particular printing setup. In other words, it is not only selling inks but also doing application-driven R&D for printing companies. Some of the applications that Saralon's inks can produce are described here:

PRINTED BATTERIES AND OLED LABELS

Printed batteries are printed on plastic and on paper. Battery technology is centuries old and batteries are produced by complicated production methods. Saralon has simplified the production of batteries by converting battery materials into inks and printing these inks into a form of thin battery. Saralon's current battery technology is based on Zn-$ZnCl_2$-MnO_2, which is a primary battery. The battery can easily be produced by any screen printing machine and by using seven different inks. These thin and flexible printed batteries can be used in different electronic devices. The example shown in **Figure 1** is a light-emitting bottle label. The label comprises thin and flexible (Organic Light Emitting Diode) OLEDs which are powered by a 6-volt thin and flexible battery. Apart from battery expertise, Saralon provides complete instruction in OLED label production. This means that a label manufacturer does not need to do intensive R&D to develop OLED-based labels.

ILLUMINATING PAPER

Figure 2 shows Saralon's latest development in the field of Electroluminescent (EL) technology. Using this technology a piece of paper can become an illuminated paper. And this is done not by any complicated and expensive machine but by using simple screen printing machines. Here, four different EL inks are printed on a 100gsm paper by a sheet-fed screen printing machine in ambient condition. After that, graphics are printed by an offset printing machine. Connecting the paper to a suitable power source can light up the printed areas. This illuminating paper can be used for multiple applications e.g. boxes, bags, posters, PoS. An additional feature of this light emitting technology is that the paper can be rolled up and can also be bent. A further advantage of paper is that its recyclability and disposability is simpler.

RESPONSIVE PAPER

The impact of NFC technology [near field communication wireless technology] is well established in the present world. Saralon is working to simplify the production of NFC-related products so that printing companies can produce them using existing printing machines. With SaralNFC LightPaper, bringing a smartphone close to the paper can switch on light from the paper and simultaneously open a weblink on the smartphone. Using SaralNFC TouchPaper, once a smartphone is placed on the paper, the paper becomes interactive; multiple weblinks can be opened by touching paper at predefined positions.

Apart from NFC, Saralon is also working on stretchable and wearable electronics, IoT and sensors. Positing itself as a 'one-stop shop for printed electronics', Saralon's aim is to develop the latest technologies and bring them to traditional printing companies, especially screen printers. ■

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