SPECIALIST printing worldwide

SCREEN-PRINTING IS THE PROCESS OF CHOICE FOR INDUSTRIAL PRINTING APPLICATIONS

Gérard Rich explains why customers push this process to the limit and beyond

The challenges of computer-to-screen (CTS) imaging have been analysed in R&D and Lüscher has developed a range of technologies to improve screen stencil-making. The resulting X!Tend software is presented in this article as one element of these technologies, fully integrated within the Lüscher CTS system. It measurably extends the range of imaging capability of CTS systems for digital stencil preparation no matter which emulsion or capillary film is used.

INTRODUCTION

A bigger fraction of screens is still imaged with film (and film setters). Imaging the emulsions with CTS devices and digital data, however, is gaining momentum and will replace film down the road.

We use, indifferently, the abbreviations CTP (Computer to Plate) and CTS (Computer to Screen) in this article.

Lüscher has made, over the years, extensive CTS imaging tests for its customers in the areas of screen for rotary and flatbed printing. Customers very often push us to the limits of the imaging processes and this is why we investigated the means to better image screen emulsions and photoresists on our range of CTP devices.

This effort led to the development of the X!Tend software that is proposed to our customer base as an integral part of our CTP imaging system.

In the following chapters, we will explain how the desired result of improving imaging performance is achieved. See separate feature panel on page 32 for basics about the Lüscher UV Laser imaging system.

THE CHALLENGES OF SCREEN EMULSIONS IMAGING

The first challenge is that the CTS imaging is the reverse of argentic film imaging (figure 1).

This is not trivial as the film, the emulsions (and the mesh) are scattering light during imaging and the results will be different. For negative elements, film imaging has an edge and, conversely, CTS has an edge for positive elements on screens.

Negative elements are however more critical for screen-printing applications.

The second challenge is that there are two chemical processes to be triggered by UV laser light. First, the emulsion has to be cross-linked in order to become insoluble during wash out and, secondly, the bond to the mesh has to be guaranteed for a safe production on press.

In order to achieve a strong bond, due in particular to light absorption in the depth of the emulsion, it may be necessary to increase the level of imaging energy beyond what would be desirable to simply crosslink the emulsion in its thickness. This may limit the imaging performance significantly and, in some instances, dramatically.

The third challenge is that, because most emulsions pre-existed recent CTS laser systems, the UV laser light absorption in the thickness of emulsions, at the laser wavelength, may be too high to get the job done easily. This requires sophisticated CTP imaging strategies whose discussion is beyond the scope of this article.

These three challenges have been addressed successfully by the Lüscher Technologies R&D with three technologies unique in this field:

- High resolution imaging
- X!Tend software
- Specialised imaging strategies

THE STANDARD CTS IMAGING RESULTS

With a special test file having line thicknesses from 10 to 200 microns in steps of 10 microns (figure 2), several high performance emulsions from different suppliers on different mesh types have been tested and evaluated quantitatively by microscope measurements of actual line widths generated on screens.

The file is printed as such and also inverted for CTS output. As already mentioned, negative lines are more critical for the applications considered here.

Please note that it is also necessary to have a close look at the TIFF output of the RIP as, in most instances, the line width written by the RIP may differ from what is in the original PDF or AI file. This is an additional

Continued over

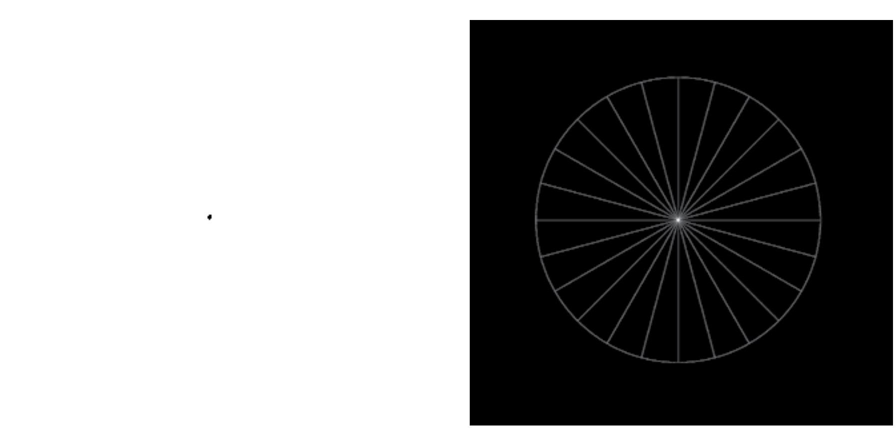


Figure 1

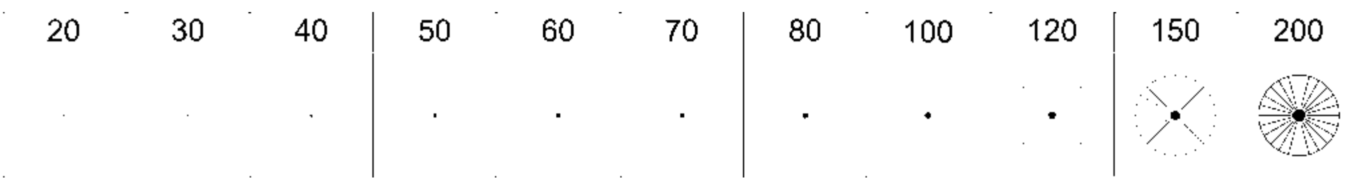


Figure 2

source of discrepancies that has been obviously eliminated here.

The typical result on screen emulsions for fine graphics applications is shown in figure 3.

The imaging is on MultiDX! at a resolution of 5080dpi and the graph in figure 3 has, on the horizontal axis, the theoretical (negative) printing line widths in the TIFF file.

The actual line widths (orange curve) on the screens are shown on the vertical scale and the results are analysed as follows:

- There is a gap between the actual line width and the theoretical width (green line) that is significant
- There is a lower limit of imaging at about 40 microns as thinner lines are not developed properly.

THE IMAGING RESULTS OBTAINED WITH THE X!TEND SOFTWARE ACTIVATED

The result on the same screen emulsion as above with the same file is shown in the next graph (figure 4).

The imaging was under identical conditions on MultiDX! at a resolution of 5080dpi with a user defined X!Tend software setting.

The results are analysed as follows:

- X!Tend almost perfectly corrects the line width (green) which is now equivalent to the file requirements
- The lower limit of imaging is pushed down to 30 µm.

The main quantified benefits of X!Tend become obvious when looking at figures 3 and 4.

Other imaging results compared for fine graphical elements are presented in comparative terms on page 33.

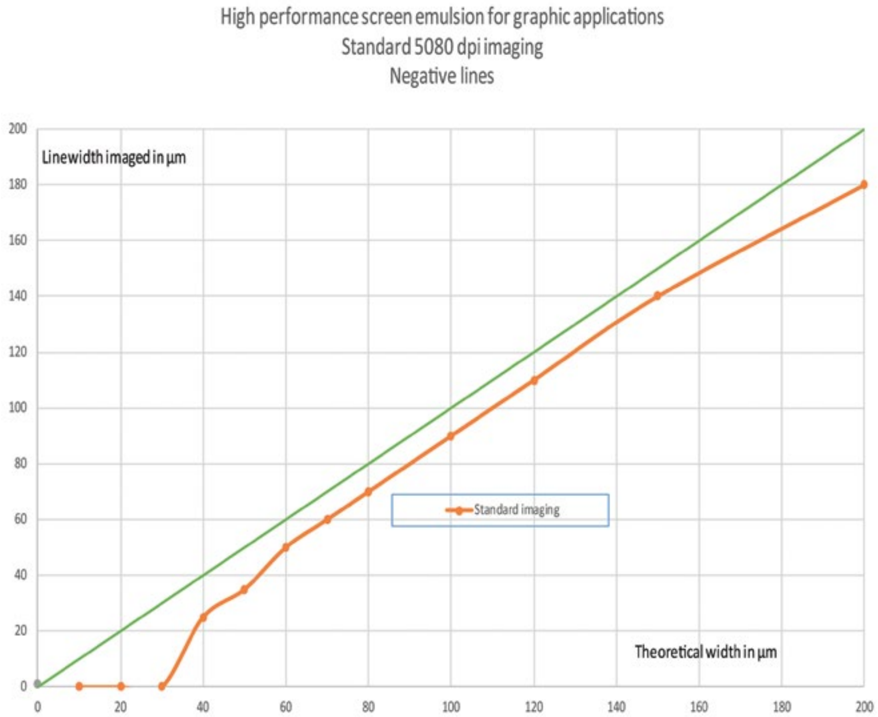


Figure 3

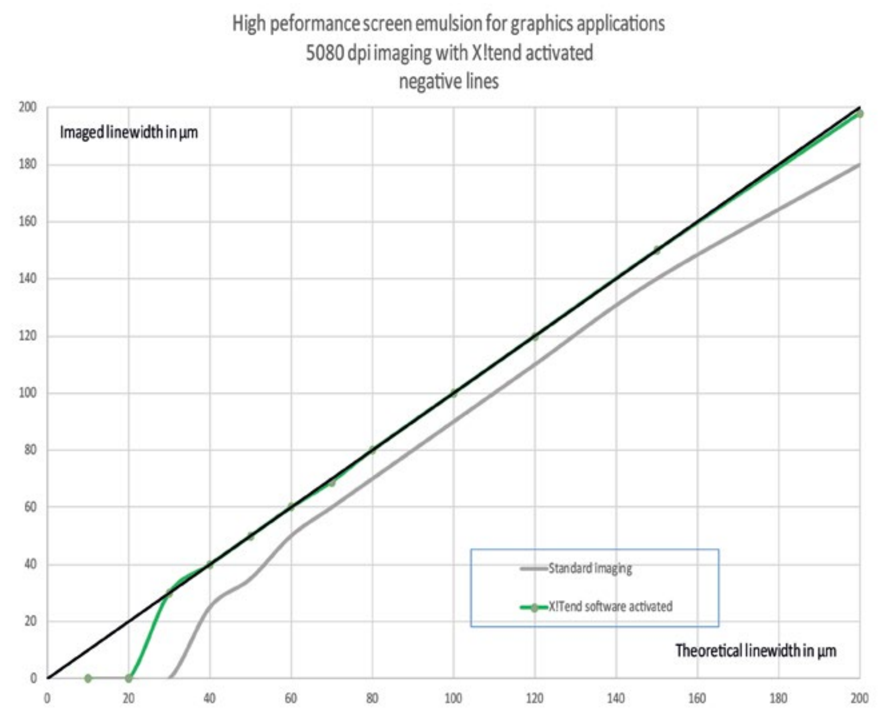


Figure 4

KEY FEATURES AND B ENEFITS SUMMARY:

The X!Tend software is extending the range of imaging capability of any emulsion or capillary film and increases fidelity of digital image reproduction on screen.

The X!Tend software widens the window of imaging energy applicable to any emulsion. More laser energy without loss of imaging quality will make the screen more robust and potentially more durable on press.

The software parameters are stored into templates for maximum comfort in production, and can be selected, or not, specifically for types of jobs and the range of emulsions used in production.

The software is resolution independent. With higher resolution however, the "unit of account" of the CTS (ie – the pixel) is smaller which means that the X!Tend correction can be tuned in finer steps.

The X!Tend software is using standard TIF input. There is no need for changes in the prepress department. The desired effects are obtained by simple user specific settings.

The selection of settings is based on standard CTS imaging results where deviations between the input file and the result on screens can be measured. It is a kind of 'finger print' for stencil making. There are rules of thumb that can be called on as well.

The TIF input is manipulated 'on the fly' during imaging and the data is generally inverted as well 'on the fly' in the same step without any loss in imaging speed.

While it is desirable to widen small negative graphical elements as demonstrated here, it is mandatory not to affect small positive elements, such as shadows and positive fine lines, that need to be imaged properly and must not vanish. They will print negative for screen applications.

The results shown here for thin emulsions for graphic applications can be transposed for thick emulsions or capillary films for industrial applications involving deposition in screen-printing of thick layers. It is applicable as an example to the generation of 3D relief effects with screen-printing.

The graphics used for those applications will be coarser in scale but the involved

Continued over

mechanism is the same with bigger corrections to be applied for bigger graphic elements.

You may find pre-press software that is doing a fraction of what X!Tend is offering. X!Tend does the job professionally, completely, automatically and for all graphical elements (including raster zones) at any scale.

The focus in this article is on screen-printing applications; imaging of (negative or positive) photoresists for etching and electroforming applications fall into a similar category with the same benefits.

CONCLUSION:

X!Tend is a professional tool to measurably improve the imaging of silk screens (rotary and flatbed). It is open in design with user-defined settings totally integrated in the output computer and software of Lüscher CTS devices.

It is qualified for a wide range of emulsions and capillary films and is applicable as well for negative or positive photoresist applications of any type. ■

Gérard Rich is in Business Development at Lüscher Technologies

Further information:
Lüscher Technologies, Bleienbach, Switzerland
tel: +41 62 919 33 15
email: grich@luescher.com
web: www.luescher.com

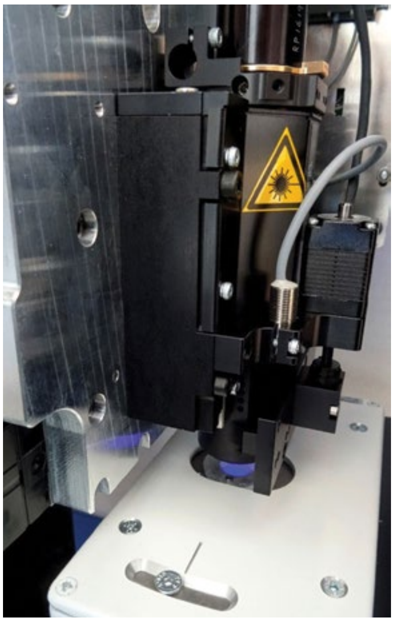
BASICS ABOUT LÜSCHER UV LASER IMAGING

Lüscher introduced UV laser imaging in 2007 for a whole range of applications. It immediately replaced lamp-based systems due to better performance and stability.

The Lüscher system is based on individual laser diodes controlled by digital data scanning the surface of screens to directly harden the emulsion.

The laser diodes are coupled individually to optical fibres carrying the energy to the raster plate and the optic.

The laser light of the whole set of diodes is collected on the raster plate at the entry focal plane of the optic and focused by the optic onto the screen surface.



Complete mounted optic assembly with laser measurement box and focus system

The diameter of the fibres, the design of the raster plate and the design of the optic determine the resolution of the CTS system with a broad range of possibilities from 600 to 10000dpi and beyond.

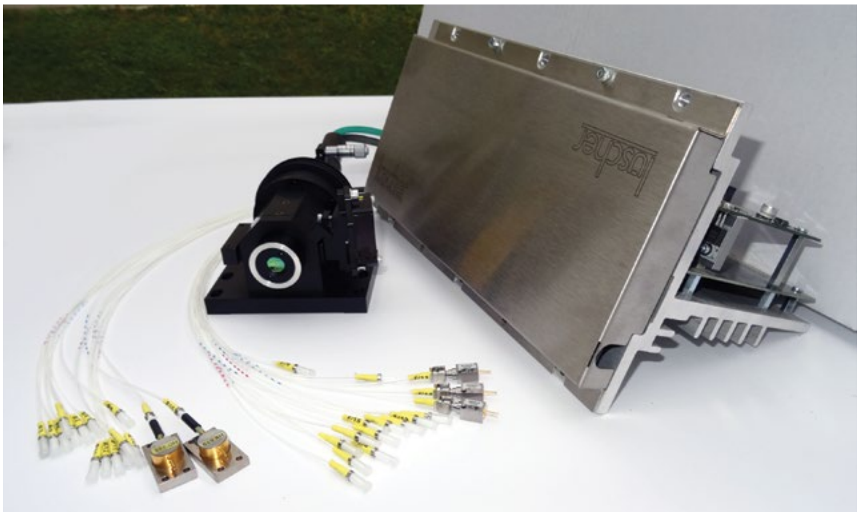
The laser light is highly collimated and penetrates straight into the material leading to sharp accurate imaging results with no possibility of undercutting.

Lasers are permanently controlled for power and the process control is total with no deviations possible.

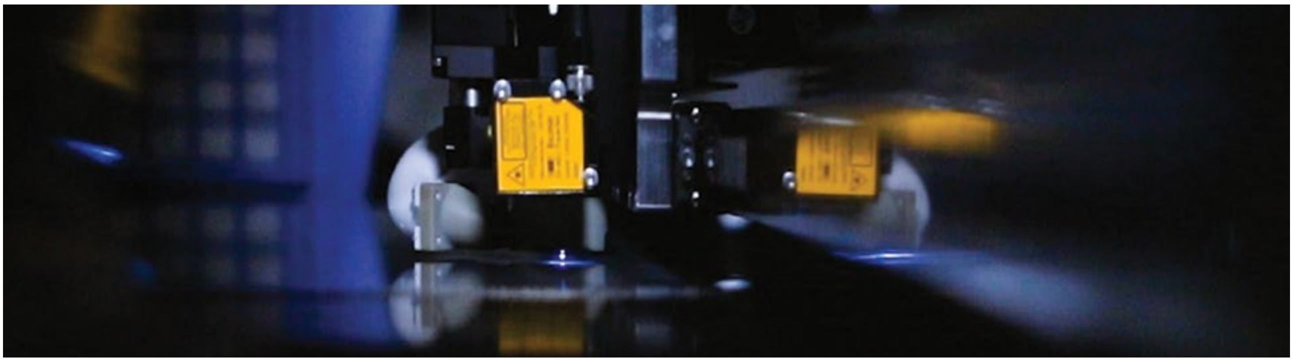
The digital input of MultiDX! is a one bit TIF file. When the pixel is on locally, the laser is on and the emulsion will be cross-linked.

Picture of UV laser diode with fibre coupled

Lüscher has already sold in excess of 150 Flatbed MultiDX! Systems with a large portion of them imaging UV sensitive emulsions, resists or films. ■



Picture of an electronic module controlling lasers, laser fibre bundle and optic.



OTHER IMAGING RESULTS COMPARED FOR FINE GRAPHICAL ELEMENTS

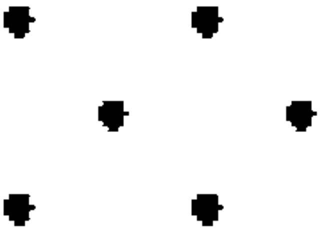
The modified file used for CTS output will lead to an accurate text reproduction on the imaged screen

Example of fine text (the pixel structure gives the scale). File prepared for argentic film imaging

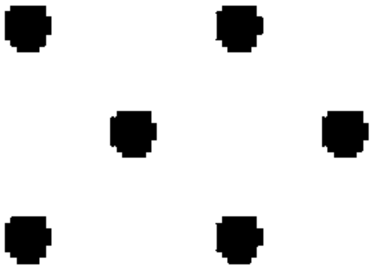
Example of fine text (the pixel structure gives the scale). File modified on the fly by the X!Tend software

Example of fine text (the pixel structure gives the scale). File additionally inverted on the fly as well for output on CTP

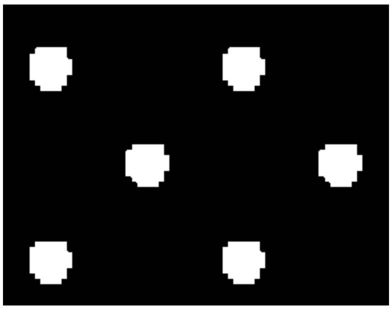
The modified file used for CTS output will lead to an accurate 4% dot on the imaged screen



Example of raster zone (the pixel structure gives the scale). File prepared for argentic film imaging

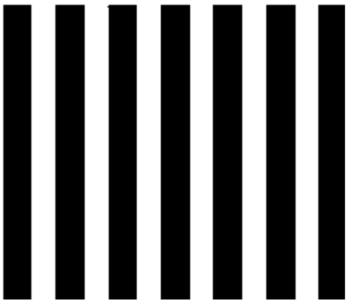


Example of raster zone (the pixel structure gives the scale). File modified on the fly by the X!Tend software

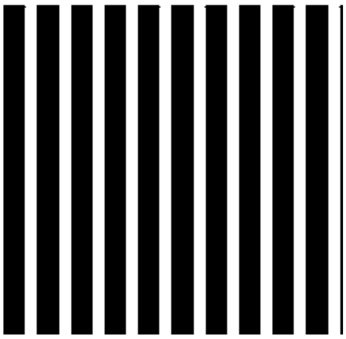


Example of raster zone (the pixel structure gives the scale). File additionally inverted on the fly as well for output on CTP

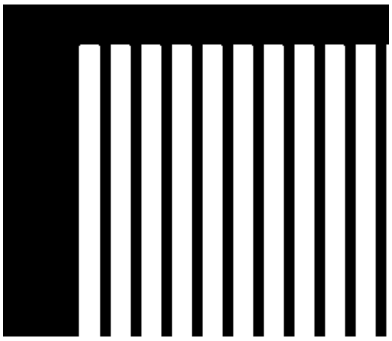
The modified file used for CTS output will lead to an accurate 4% dot on the imaged screen



Example of alternative lines (the pixel structure gives the scale). File prepared for standard argentic film imaging



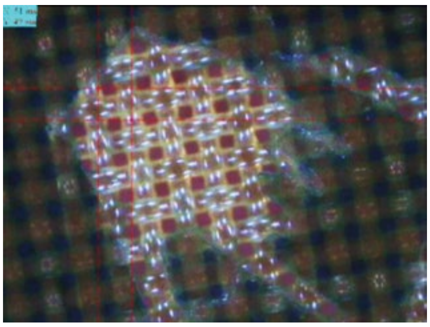
Example of alternative lines (the pixel structure gives the scale). File modified on the fly by the X!Tend software



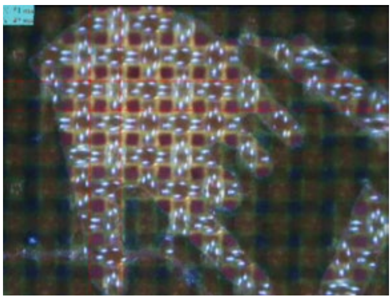
Example of alternative lines (the pixel structure gives the scale). File additionally inverted on the fly as well for output on CTP

As you can see, the fingers in standard exposure mode are gone. The X!Tend exposure is significantly improved

Extract of TIF file as prepared for CTS output



Standard CTS exposure result



X!Tend exposure result