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PROCESS PRINTING WITH UV INKS

Process technology is a reproduction process used to reproduce the contents of halftone patterns, such as photos by printing techniques. Original colours are usually reproduced by means of four colour process technology. The base of this process is the reproduction of the halftones with a certain number of different sized process dots per centimetre (AM halftones) or by dots of the same/or different size in different numbers per centimetre (various FM halftones). The halftone effect occurs when the human eye perceives the individual halftone dots “melting” into a mixture of printed and unprinted surface. The following information is based on the AM halftone (auto-typical halftone). Therefore the number of lines, i.e. the resolution should not be perceivable to the observer. As the human eye only has a certain limited resolution in relation to the distance to an object, very fine mesh counts are required for short distances whereas for large distances you can use coarser fabrics. Printing technologies such as letter press, gravure printing (also pad printing) as well as offset printing can print finenesses of >80 lines/cm with maximum tonal values. However, there are certain limitations for the screen printing process. Contrary to above printing technologies screen printing is a through printing process. The strengths of this technology such as printing of thick layers, coarse particles, and various ink types/substances will be a certain handicap when it comes to process printing. When printing very fine details the screen fabric will impair passing through of the ink to a certain extent. Thus the more screen lines the more difficult will be the reproduction of tonal values. For UV inks the following limit values apply:

Halftone lines of 24 L/cm will result in a printable tonal value of 5-95% full surface. Using 32 L/cm this will be reduced to approx. 10-90%. About 20-80% can be reproduced using 48 L/cm. This value will be even more reduced using finer lines, however we would like to mention the fact, that compared to solvent based inks, UV inks with their unlimited screen openness have a significant advantage, especially in respect to bright tonal values. Screen printers need to pay attention to some basic facts, which significantly differ from these experiences obtained with solvent based process inks, in order to successfully print halftones with UV inks.

Solvent based process inks have a solids content of approx. 20%. This means that the printed ink film will shrink by about 80% during the drying process and will form a very flat process dot. Just like all UV inks UV process inks have a solids content of nearly 100%. The ink film will be completely cured. Using the same processing conditions a UV halftone dot is about 4 times higher than that of a solvent based ink. Thus the parameter used for solvent based inks cannot be used for UV inks. The decisive factor is the reduction of the ink film, which depends on choice of fabric and coating of the stencil.

MESH-COUNT

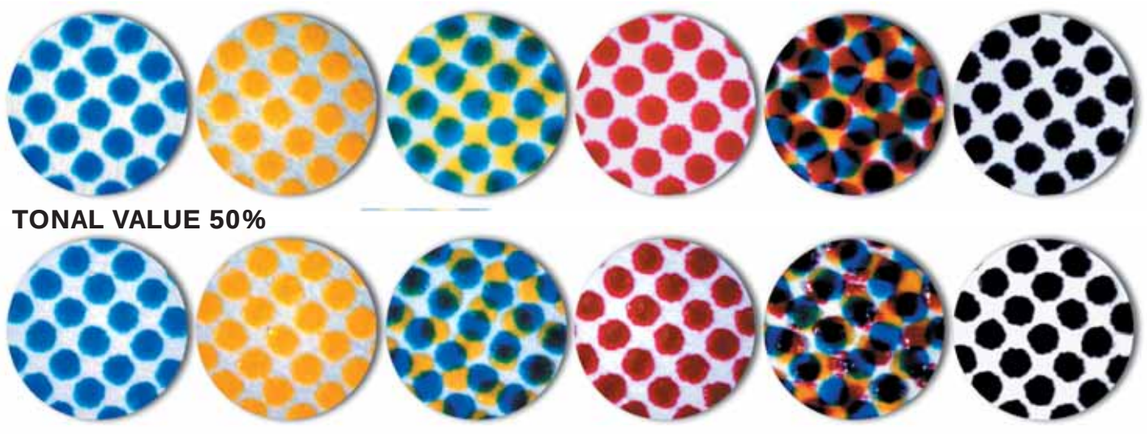
Mesh counts of 140–165, sometimes even 180 threads/cm are used for UV process printing. Experience shows, that printing the halftone motive with the thinnest possible thread diameter of a fabric type will show best possible results.

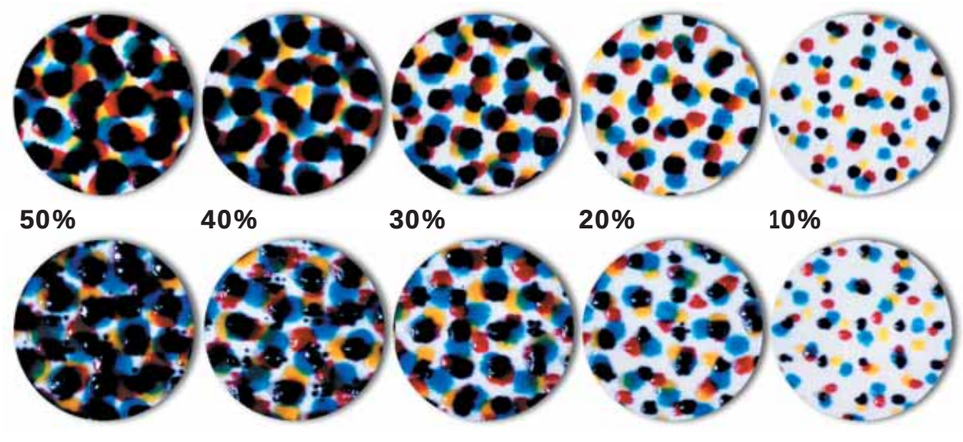
Example: A 150-31 fabric will have a significantly higher theoretical ink volume (10,9 cm^3/m^2) compared to a 150-34 fabric (6,6 m^3/cm^2), however, with 39µ it is much thinner than a 150-34 with 45µ (actual measuring value of the stretched fabric). Thus using a 150-34 there will be a thicker ink layer for printing of the individual halftone dots, even though the same stencil coating is used. In the most unfavourable case there will be problems in four colour applications when printing one layer on top of the other. The colours printed first, e.g. cyan and yellow with their dots next to each other or on top of each other will form such a high ink pile, that the process dots of the third and forth colour, mostly in certain medium tonal values, cannot be correctly printed onto the structured surface. This phenomenon is clearly shown on the microscopic pictures below as well as on the following pages. Thus the screen printer should try to work with a fine fabric and low thread diameters. Screens should be coated with high quality, finely dispersing copy emulsions. Coating should be thin, however should not be too rough (Rz values; roughness values).

EMPIRICAL RULE:

“Two thread counts and one mesh-opening“ result in the limit value of the printable dot.

The pictures below show the complete scale of prints (enlarged) of a process set printed with PET 1500 fabric 150-31Y PW and 150-34 Y PW





Fabric:
PET 1500 /150-31 Y PW
Copy emulsion:
MURAKAMI ONE POT SOL G
Machine coating:
1D:1R intermediate drying + 1D *
Copy layer: 4 µm
Roughness value: Rz 9 µm **

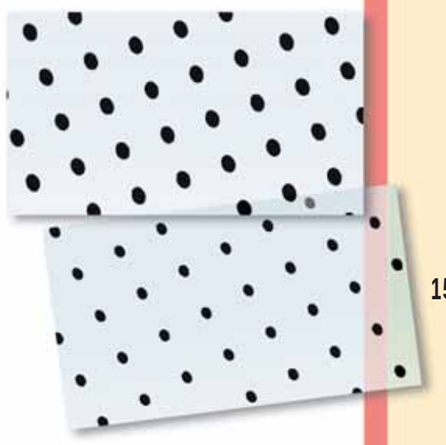
Fabric:
PET 1500 /150-34 Y PW
Copy emulsion:
MURAKAMI ONE POT SOL G
Machine coating:
1D:1R intermediate drying + 1D
Copy layer: 3 µm
Roughness value: Rz 13 µm

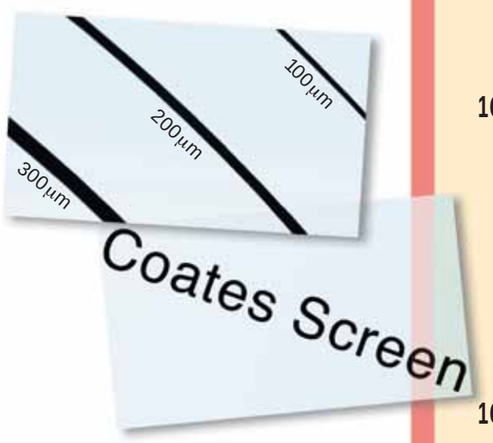
* D = printing side / R = squeegee side
** RZ = roughness value

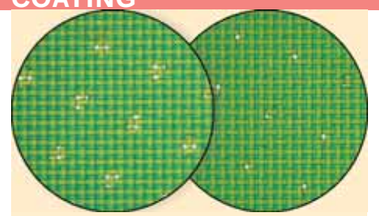
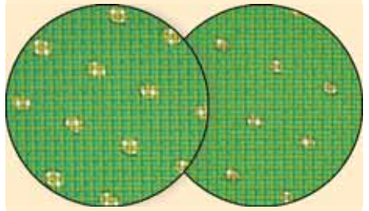
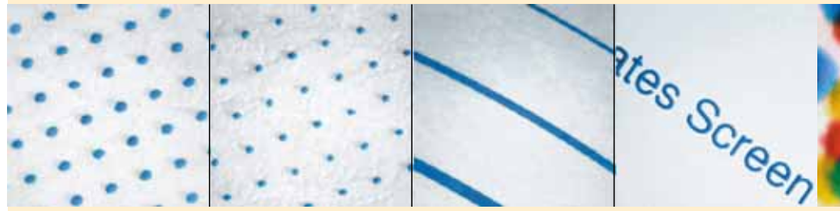
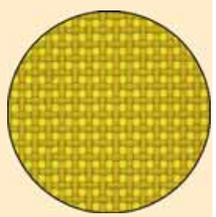
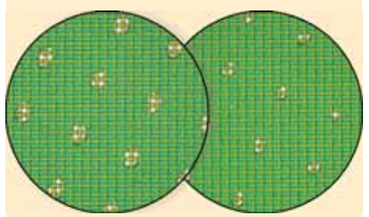
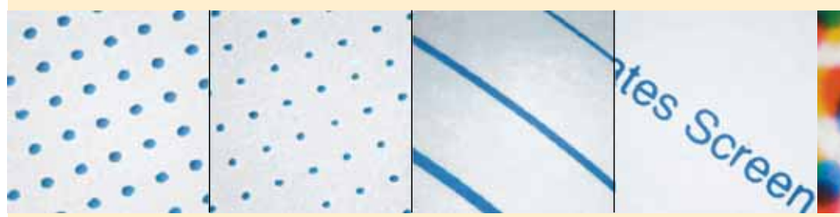
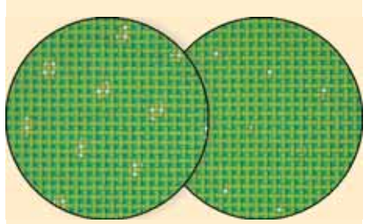
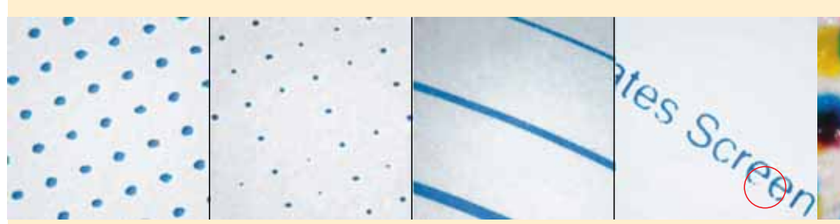
PROCESS PRINTING WITH UV INKS

These two pages show a comparsion of various types of fabric and their printing properties. All photos and their parameter were determined and compiled at the Coates Screen Inks GmbH Screen Center.
In order to best possible demonstrate these facts we used several enlargement factors.

FILMS





	FABRIC	COATING	ONE COLOUR PRINTS WITH UV INK UVX 182	PRINTING RESULTS
150-34	 Thickness of stretched screen 45 µm	 Copy emulsion: ONE POT SOL G	 Stencil layer: 3 µm, Roughness value: Rz**13 µm	 (○) increased squeegee pressure required, reduction of tonal value, significant distortion of colours due to high thickness of ink layer
150-31	 Thickness of stretched screen 39 µm	 All screens were machine coated: 1D* : 1Rz** intermediate drying + 1D*	 Stencil layer: 4 µm, Roughness value: Rz** 9 µm	 Printing result ok.
165-27	 Thickness of stretched screen 34 µm	 Exposure time: 60-65 units 3500 watt / metal halide distance 1,1 m	 Stencil layer: 4 µm, Roughness value: Rz** 7 µm	 Printing result ok.
165-31	 Thickness of stretched screen 39 µm		 Stencil layer: 3 µm, Roughness value: Rz**10 µm	 (○) increased squeegee pressure required, reduction of tonal value, significant distortion of colours due to high thickness of ink layer
		10 % 5 % tonal value	10 % 5 % tonal value	100 µm 200 µm 300 µm writing enlarged 4 dots

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* D = printing side / R = squeegee side
** RZ = roughness value