TEST TARGET FOR MEASURING RELIEF IMAGING ON A DIGITAL PRESS

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ABSTRACT

Combining prepress software and the Kodak NexPress digital press's fifth imaging unit with dimensional Clear Dry Ink, provides the capability to economically produce commercially accepted relief imagery. This opens significant opportunities for creative designers, using existing off-the-shelf software, to print color relief electrophotographic printing on a range of substrates. A test pattern page is used to explore the capability of dimensional imaging on Kodak NexPress. Typical process application examples are also provided.

1. INTRODUCTION

Electronically printed pages continue to improve in image quality, speed, reliability, and run lengths. Digital Printing is growing up. One recent innovation is demonstrated by Eastman Kodak Company's ability to print relief images with its NexPress digital presses. Kodak calls this Dimensional Printing. To print digital relief images, Kodak employs its Dimensional Clear Dry Ink (DM-CL) toner that, when applied to a substrate and heated at the press fusing system, results in a printed relief image as high as 28 microns (Eastman Kodak Co., 2009). This advance offers electronically printed pages the ability to have the communication benefits of raised imaging. Creative designers now have a new tool to communicate with. The images shown at the end of this article have this clear layer printed inline on the fifth imaging unit of the Kodak NexPress S3000 at RIT (upgraded from 2100 plus). The technology can be retrofitted to existing two generations old NexPress equipment in the field.

Kodak's dimensional toner is clear and allows preprinted color underneath the dimensional layer to show through. The DM-CL layer can be created and controlled using existing creative software such as Adobe Illustrator, Photoshop, or InDesign and thus does not require specialized software. Particularly noteworthy is that Kodak has designed this system without the environmental impact of volatile organic compounds (VOCs). The DM-CL toner is child safe; has met some strict European Food packaging regulations, passing the ISEGA 2007 European Safe for Food Approval; and, in addition, has also passed the European Ingede Method 11 deinking test process (Ingede, 2007; Eastman Kodak Co., 2008).

Examples of digital relief printing include printing the structure of textiles, embossed leather, surface effects like the texture of wood or the skin of an orange, or of lizards, and others. In some applications Kodak dimensional imaging can replace thermography. With digital relief printing, additional benefits for the visually impaired can be achieved, for example, feeling waterfalls in a picture of Niagara Falls.

2. TEST TARGET

Figure 1 shows a test page with test targets that allow measurement of Kodak's DM-CL toner. The thickness of the clear toner can be varied by using different tone values, as demonstrated by the parallel lines targets where toner is applied

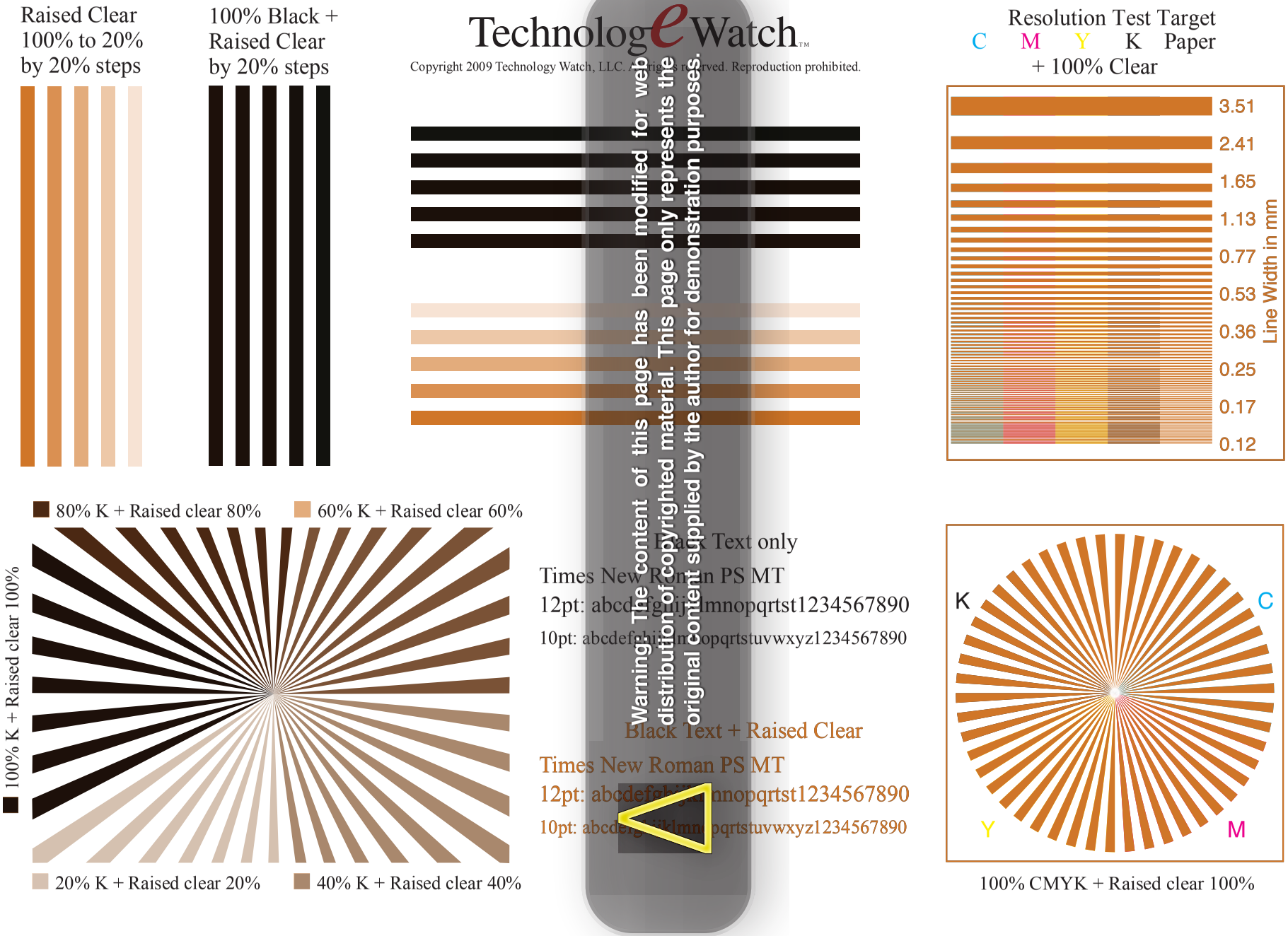


Figure 1. Dimensional testform.

in steps of 20% increments. Figure 2 shows that for lines finer than .25 mm, black lines are still resolved, while clear lines start to blend. However, the resolution of the clear layer is still far more than can be detected by a finger.

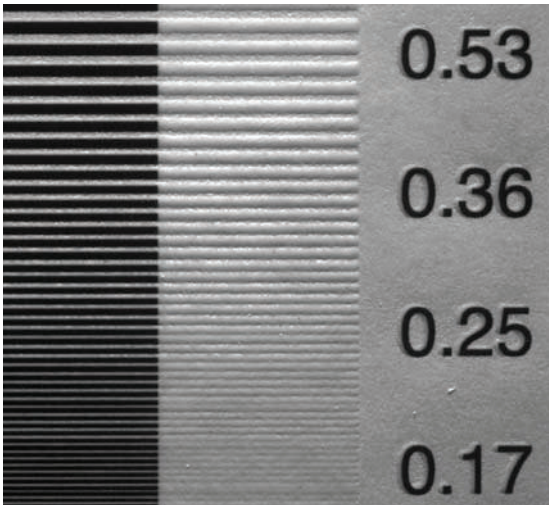


Figure 2. Side lit view of resolution test target shown at 260% magnification.

On page 18, Figures 3 and 4, the book image uses a clear toner image generated in Photoshop from the photographic image itself; the flower image uses a manually drawn clear toner image.

3. PROFILOMETER MEASUREMENTS

During production it might be useful to have a repeatable way to measure and control dimensional printing. The printing industry does not have a standard touch and feel (nor, in our research, could we find a legal definition of the relief height for Braille printing for the blind). In a laboratory setting, a profilometer can be used to measure the height of the relief. In reality, the measurement to the end user is their fingers.

Measurements were made using a Surtronic 3+ profilometer from Taylor Hobson Ltd. at the Mechanical Engineering Department at RIT on the clear layer of the resolution target which was printed on the test form of Figure 1. Graph 1 shows the profilometer trace. Paper unevenness was in the order of ±10 microns (not shown). Because of this and also because the very fine lines melt together, the valleys of the graph are not all on the same level. But the relative amplitudes of the lines can still be read as a function of line width.

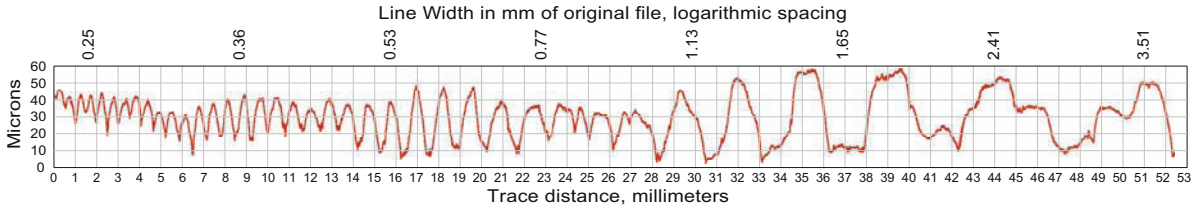
The 28 microns that Kodak claims for amplitude is reached at about a line width of 0.53 mm, however, wider lines can have an amplitude of as much as 50 microns. Wider lines have distortions due to the paper thickness variation. (For reference, the paper thickness in this book is ca. 93 microns, a human hair is about 60 microns). There was no difference in thickness due to the color of the underlying ink.

4. REFERENCES

Eastman Kodak Co. (2008). Kodak shows attendees electrophotographic solutions that are approved for food and toy applications. Retrieved at: http://graphics.kodak.com/US/en/about_gcg/news/2008/080609b.htm

Eastman Kodak Co. (2009). Website at: www.kodak.com/go/dimensional. File with specifications at: https://graphics.kodak.com/KodakGCG/uploadedFiles/NxP_DMCL_DS_211_US_LR(1).pdf

Ingede (2007). INGEDE Method 11: Assessment of print product recyclability - Deinkability test. PDF available at: http://www.ingede.com/ingindxe/methods/ingede-method11-2007.pdf



Graph 1. Profilometer trace of clear layer on resolution target.

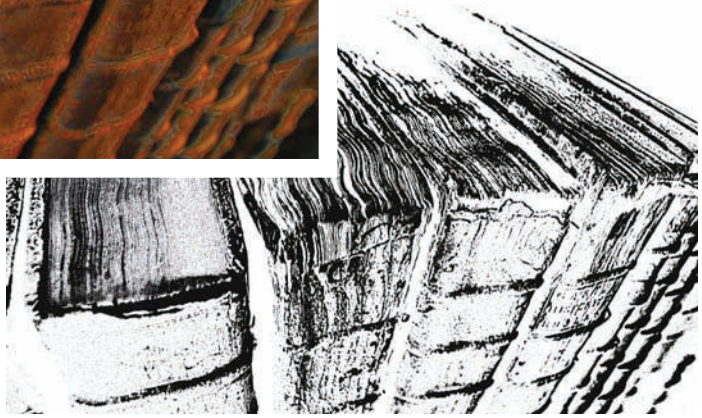


Figure 3. Image using Dimensional layer which was made in Photoshop.

Figure 4. Image using Dimensional layer which was made by hand drawing.