The Printing Quality Control of HP Indigo Digital Printing Machine

Huang Beiqing, Gu Lingya, Yan Yanni, Wei Xianfu, Zhang Wan, Liu Jianghao; School of Printing & Packaging Engineering, Beijing Institute of Graphic Communication; Beijing, China

Abstract

In order to ensure printing quality of HP Indigo digital press1050, the prints was printed on three kinds of paper through different compensation curves and changing developing drum voltage and laser energy value. With testing the solid ink density and dot area percentage of prints, the effects of these factors on digital printing quality were studied and two methods that adjusting dot area percentage were compared. The results indicate that different compensation curves have different effects on dot gain, the increase of developing drum voltage can improve solid density, and the increase of laser energy value can enlarge dot area percentage and the method using color control to adjust dot area percentage is more accurate than color match.

***Key Words**: quality control, develop drum voltage, laser energy, compensation curve*

Introduction

With the rapid development of digital information technology, printing industry has come into the digital printing era from the analog printing era. With the advantages such as high speed, flexibility, simple process and short cycle, digital printing provides an innovative and efficient solution for media production and information exchange and has become the developing trend of printing[1]. As the fast advancement of the digital printing, there is an increasingly high demand for its quality. HP Indigo digital press is representative for its typical application of xerography, which is one kind of the main digital printings [2]. Therefore the study of the printing quality control methods of HP Indigo digital press is useful for improving the quality of xerography.

Experiment

Materials

128g/m^2 coated paper/gloss;
157g/m^2 coated paper/matte;
145g/m^2 uncoated paper

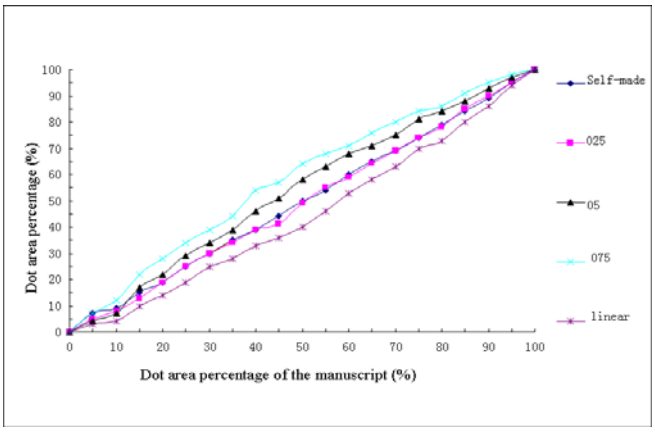
Equipments

HP Indigo Digital Press 1050;
Xrite-528 Spectro-Densitometer

Results and discussion

The impact of compensation curve on the tone reproduction

HP Indigo Digital Press 1050 has five given compensation curves.128g/m^2 coated paper/gloss is printed separately with four compensation curves: linear, 025, 05, 075, and the self-made compensation curve. Tone reproduction curves are then measured, as shown in **Figure 1**.



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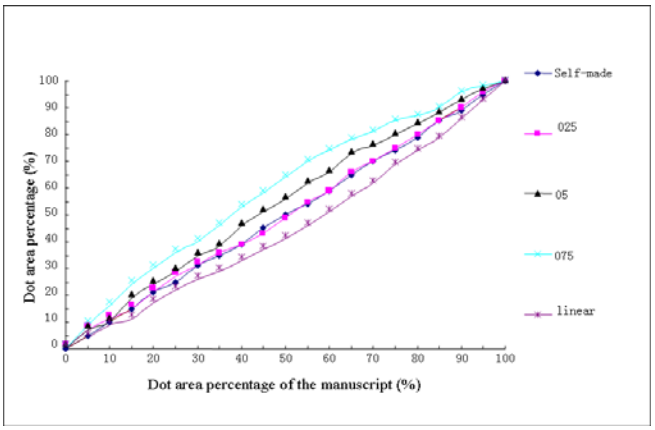

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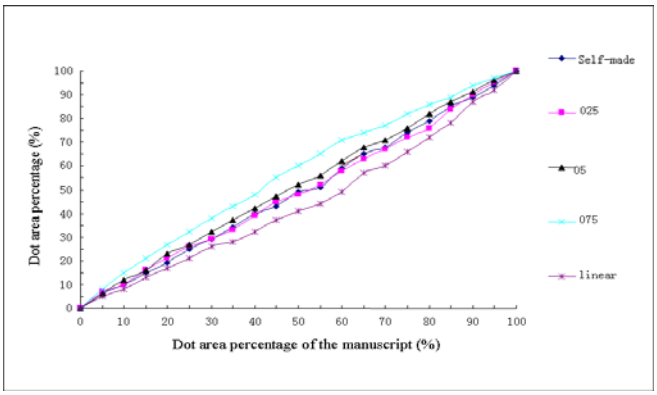

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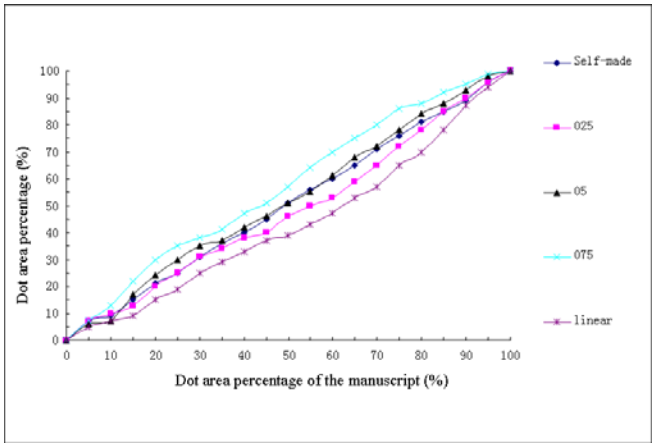

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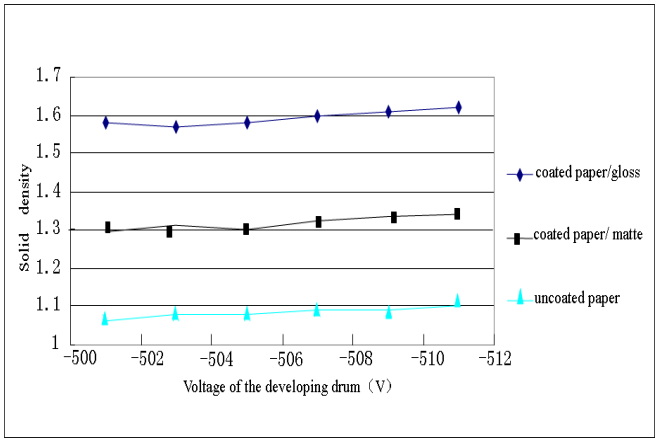
Figure 1*. The impact of compensation curve on the tone reproduction*

As can be seen from **Figure 1**, the dot gain with linear is the least, and even reduces in the four given compensation curves of the press; the 025 and the 05 compensation curves' dot gains are gradually increasing; and the 075 compensation curve obtained the largest dot gain. This is because with the linear compensation curve of HP Indigo digital press 1050, printing dots obtain no compensation, but the other three compensation curves use the dot gain compensation and the greater the number the larger the dot gain. In addition, from **Figure 1** also can be seen that with the self-made compensation curve, the presswork has good tone reproducibility. Therefore, in order to ensure the tone reproduction of digital prints, it requires a right choice of compensation curve in accordance with the requirement and the pre-press printing process. And according to the tone reproduction characteristics of the digital press, the tone value and scale of the manuscript would be better reproduced with self-made compensation curve.

The impact of voltage of the Developing drum on the tone reproduction of the solid density

With the other process conditions of the press unchanged, by changing the voltage of developing drum, the prints are printed on three kinds of paper. The solid density value is shown in **Figure 2**.



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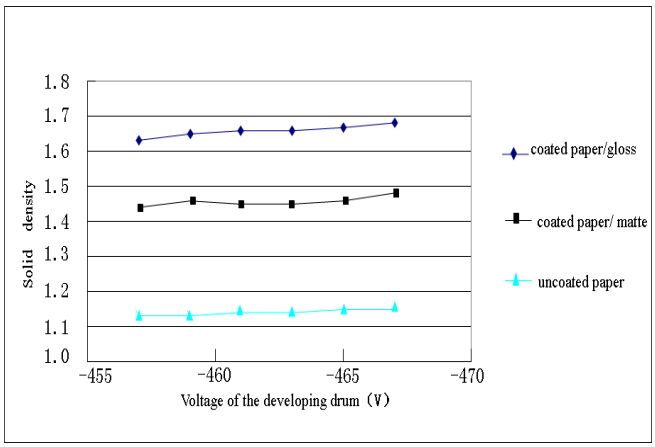

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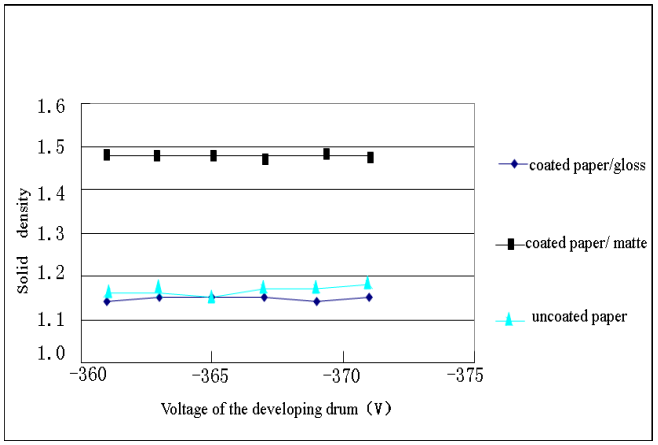

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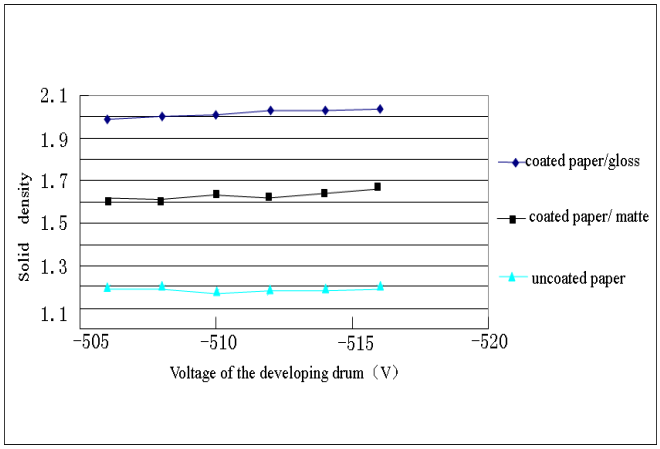

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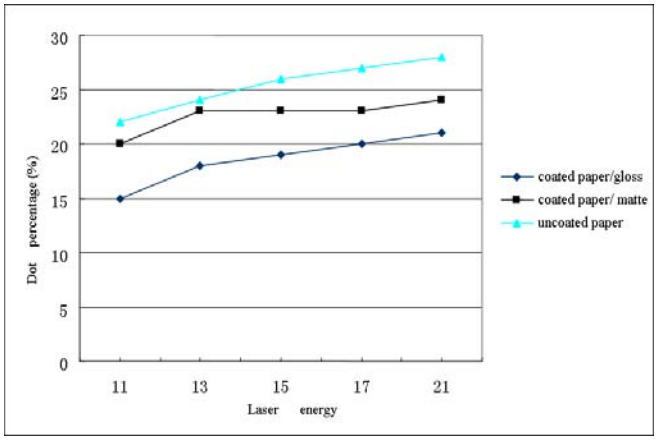
Figure 2. *The impact of voltage of the developing drum on the solid ink density in tone reproduction*

In **Figure 2**, with the increasing voltage of the developing drum, the solid density of most prints raises, but to a certain value it will not improve any more, and the raise is not great. At the same time, the voltage does not affect certain papers printed with certain inks. For example, 157g/m^2 coated paper/matte printed with yellow ink, and 145g/m^2 uncoated paper printed with black ink. The voltage of the developing drum of HP Indigo1050 is

negative, and voltage of the graphic part on PIP (Photographic Image Plate) is about -100v, the electric field between them can force the negative charged ink to be absorbed to the graphic part on PIP [3]. Raising the voltage of the drum, that is an increase of negative voltage, as the electric field force of the graphic part on PIP increased, leads to more ink absorption on the graphic part. So it can increase the solid density. However, after all ink has been absorbed on the graphic part on PIP, increasing the negative voltage of the developing drum will not affect the ink absorption capacity, therefore will not increase the solid density. In short, by changing the voltage of the developing drum can adjust the transferred ink quantity, thereby the solid density is under control. In addition, seen from **Figure 2**, 157g/m^2 coated paper/matte printed with yellow ink can obtain high solid density, as this paper has good affinity with HP Indigo yellow ink, and then a high rate of ink transfer. 145g/m^2 uncoated paper has a lower density, which is connected with the performance of paper and ink transfer is relatively low [4], especially with the HP Indigo black ink.

The effect of Laser energy on the dot area percentage

Fixing the other process conditions, changing the value of laser energy and printing on three types of paper, the dot percentage of the prints in area which is 10% on the manuscript is measured, as shown in **Figure 3**.



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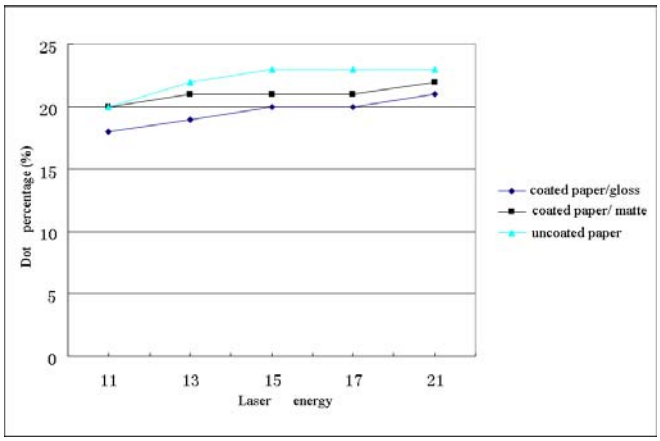

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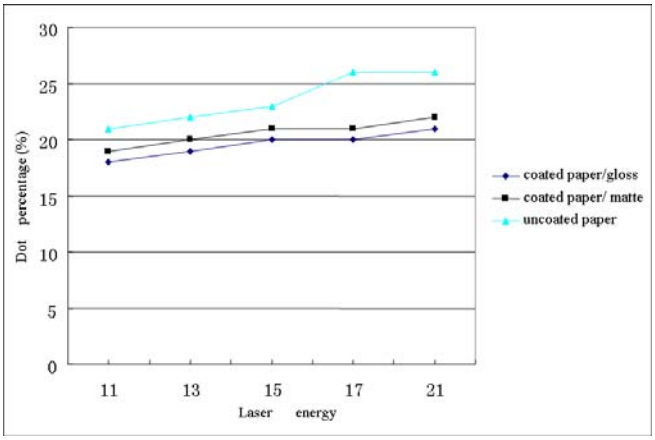

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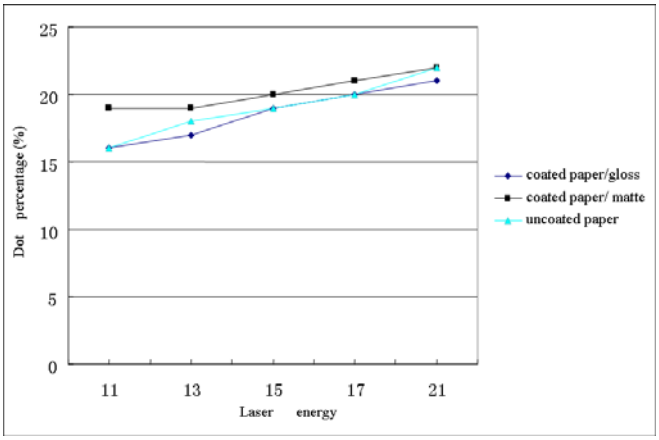

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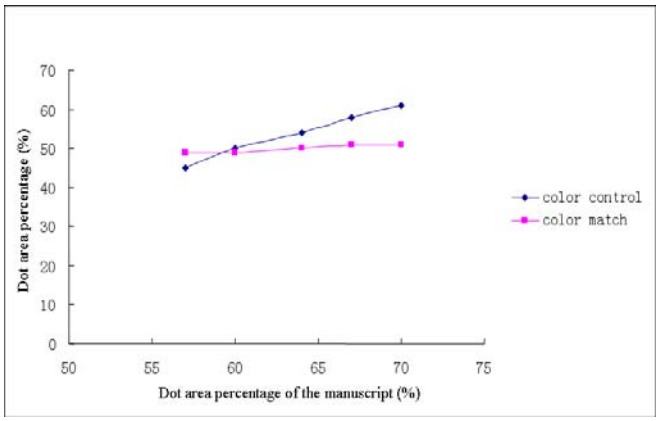
***Figure 3**. Effect of laser energy on the dot area percentage*

As can be seen from **Figure 3**, with the increasing of laser energy, the dot area percentage also increase. This is because increasing the laser energy of HP Indigo digital press, in fact, will increase the diameter of the laser beam so that the dot area percentage is increased. Therefore, by adjusting the laser energy can control the dot area percentage. In addition, from **Figure 3**, 145g/m^2 uncoated paper has larger dot gain, which is considered in connection with the performance of paper [4].

Analysis on the method to adjust the dot area percentage

There are two dot area percentage controlling methods in HP Indigo digital press 1050: color control and color match. The effects of these two methods on tone reproduction are shown in **Figure 4**.



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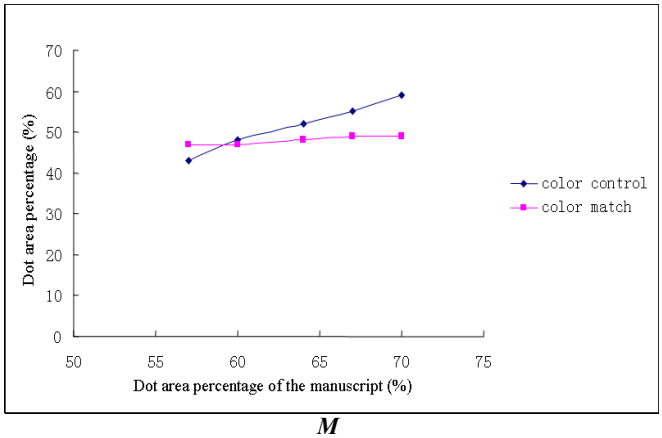

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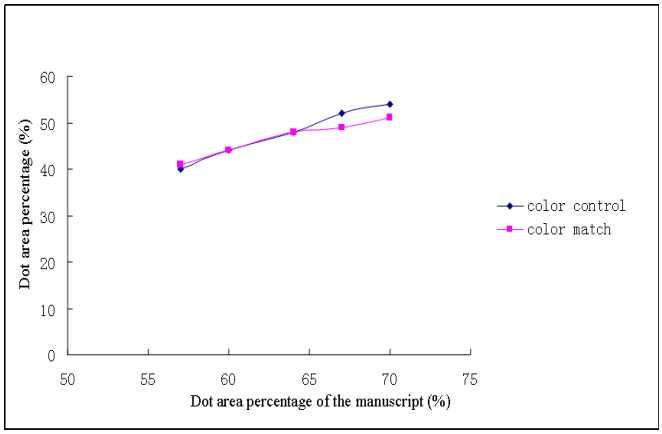

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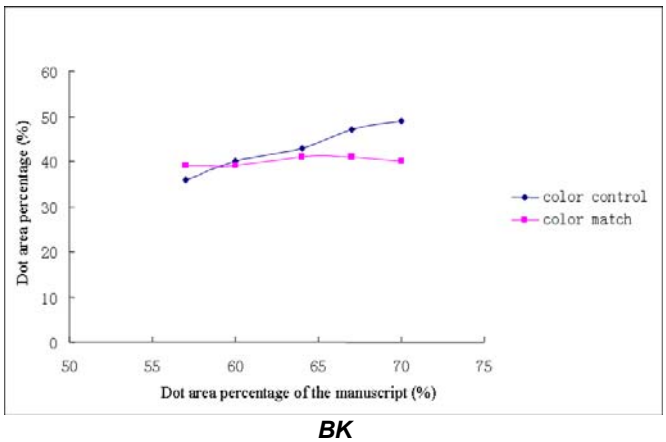

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***Figure 4**. Effects of color control and color match on tone reproduction*

In **Figure 4**, the adjustment by color control has higher accuracy and larger scale than the color match's. Because these two methods of HP Indigo digital press for adjusting dot area percentage have different principles, for color control is by changing the pre-press file data, but for color match is by adjusting the laser energy.

Conclusion

For HP Indigo digital press, in order to ensure the tone reproducibility of the prints, it's important to make a correct choice of compensation curve. The compensation curve is mainly by means of dot gain compensation, and we can also use self-made compensation curve according to the tone reproduction characteristics of the digital press. The solid density can be controlled by changing the voltage of the developing drum. The solid density can be improved to a certain value by increasing the voltage; the dot area percentage can be controlled by adjusting the laser energy, and increase the laser energy can increase the dot area percentage; the adjustment by color control has higher accuracy and larger scale than the color match's. In addition, the printing performance of paper determines the ink transfer rate, and has an impact on the solid density and dot area percentage.

References

[1] Liu Quan-xiang, Digital Printing Technology [M]. Beijing: Printing Industry Press, 2006.

[2] Yao Hai-gen, Digital Printing Technology[M]. Shanghai: Shanghai Scientific & Technical Publishers, 2001.

[3] Zhang Yi-xin, Principle and Technology of Digital Printing[M]. Beijing: China Light Industry Press, 2007.

[4] Hu Wei-you, Digital printing and Computer to Plate Technology [M]. Beijing: Printing Industry Press, 2007.

Author Biography

Huang Beiqing is an associate professor of Beijing Institute of Graphic Communication. She teaches many printing courses in school of Printing & Packaging Engineering. Her work has focused on the development of printing materials and printing technology.