

The Use of Gloss Effects from Inkjet Printing for Brand Identification, Personalisation and Security

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Abstract

The use of gloss difference on printed material as an anti-counterfeit measure is growing rapidly. There are various printing methods available to do this using a variety of technologies.

This presentation will show how the evolving technology of inkjet consumables can use gloss effects to provide end-user benefits in terms of brand identity, personalisation and security. It will be illustrated by examples of a number of ink/media combinations that show particular features that differentiate the printed output from that produced by other technologies. Possible applications and customer benefits will also be described.

Introduction

The need for printing methods to counteract counterfeiting has a long history. New techniques are established but then circumvented by forgers. As a result there will always be a call for new printing techniques to deter forgery and readily identify illicit copies to both machine readable and visual inspection.

The market opportunity on both sides is immense. In 2003 it was estimated that American industries lose around \$250 billion a year to counterfeiting.¹ It is estimated that counterfeit products make up as much as 9% of world trade. In addition there is a national security dimension in that strong links are seen between counterfeit trading and international terrorism.²

Counterfeiting was once a skilled task. However, with the ready availability of high quality document scanners, PCs and desktop printers it is now comparatively easy to copy various printing techniques previously considered relatively secure.

As a result of these market forces the business opportunity for new security printing techniques that can defeat this type of copying is very attractive.

The Use of Gloss Effects for Security

One way to defeat desktop copying is to embed some machine or visually readable information into the *gloss* of the print. This information is then readable by viewing the gloss information as a specular reflection and as an image separate and distinct from that viewed by diffuse

reflection. However a conventional copier or scanner cannot see this specular information. Indeed, these devices are designed to avoid specular reflected light by illuminating at an oblique angle and detecting normally to the print. This is because the specular component normally contains little information of interest and reduces colour saturation.

There are a number of examples of the use of gloss effects for security applications. One high profile example is the new \$20 US banknote, designed to stay one step ahead of counterfeiters. Introduced in May 2003 amongst other security features it contains a "20" that is printed in ink that has a colour that varies with the gloss viewing angle.

Also of interest here is the Xerox Glossmark technology.³ Glossmark technology uses a toner or ink that has a gloss different to the substrate and will work best where these differences are pronounced. It works by modifying the halftoning structure in a directional fashion and is most applicable to midtones where the halftone structure reveals significant printed and unprinted areas.

There is another technology that may have significant benefits for Brand Identification, Personalisation and Security – inkjet printing.

Gloss Effects in Inkjet Printing

The use of gloss effects in this context relies on the fact that inkjet inks can be formulated to give identical colours but different gloss levels. This means that if a print is made using a combination of these inks information can be printed that is readable only in the form of gloss information. It is therefore invisible to the copier and scanner systems mentioned above. This technique can be used to produce gloss effects for security without the directional nature of the halftoning structures used for the Glossmark system.

The effect is illustrated by Figure 1. This is a plot of the gloss level⁴ of a print made using 2 different black inks on the same glossy, porous inkjet media. It can be seen that these 2 inks give completely different gloss levels for the same visual densities.

It should be noted that the only reason these charts show gloss levels greater than 100% is that these inks are more glossy than the reference material used.⁴

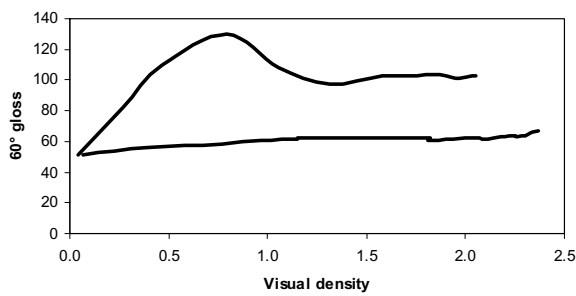


Figure 1. Gloss of 2 black pigmented inks on glossy media

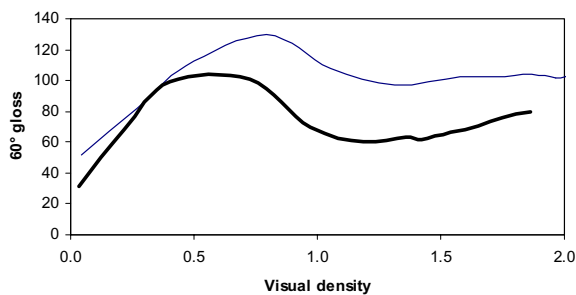


Figure 2. Gloss of black pigmented ink on 2 glossy media

The extent of this gloss modulation is a function of ink formulation. It is also a function of the characteristics of the inkjet media too, as illustrated by Figure 2. This shows one of the inks from Figure 1 printed onto 2 different glossy porous media.

This again has security implications as a different ink/media combination will give a changed result.

Machine Readability

Gloss effects also lend themselves to machine readability as the equipment can be simple, cheap and compact.⁴ Gloss level measurements also tend to be angle sensitive, adding to the security possibilities.

There is one further attribute that is pertinent to machine readability. This is the fact that such inks can be made to exhibit coloured gloss effects. Here we are not talking of the effect known as metamerism which is a known issue with pigmented inks.⁵ Whilst metamerism is a change in colour with different illuminant *type* gloss colour is a change in colour with different illuminant *angle*, as exhibited by the \$20 bill discussed above. With the judicious choice of gloss angle and colour filtration a sensitive yet robust system could be designed.

Although the examples above were done using a black ink they can be formulated to work with any other ink colour or combinations thereof.

And finally, there is one last twist to this opportunity. As described above, most printing systems likely to be used by forgers produce some differential gloss effects. This can be removed by lamination but use of a sealable layer incorporated at media manufacture can allow for further gloss security effects to be introduced.⁶

Conclusions

Gloss effects provide an additional tool in the continuing fight for security and brand protection against forgery. Existing applications can be supplemented by the use of inkjet printing technology. The technology is also applicable to both human and machine readable systems.

Acknowledgement

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Biography

Alan Hodgson joined ILFORD Imaging in 1982. After a number of technical support and Sales & Marketing roles his final role was Technical Services Manager at the head office in the UK, covering both traditional silver image and emerging ink jet technologies.

In 2004 he left to become an independent consultant on non-impact printing, specialising in inkjet technology. His particular interests are in image quality and permanence issues and the way in which these can be used as security features.