

## Security Features in Currency: A Study on Their Importance and Efficacy in Printing Technologies

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### ABSTRACT

In the modern era of Printing Technology, currency printing is the abstract of all printing applications. Most of the banknotes employ four types of printing processes namely Lithography, Intaglio, Letterpress, and Silk Screen Printing.

**Ink Features:** All the inks used in bank note printing offer a certain amount of security because they are not commercially available and hence not available to would be counterfeiters. The inks used have to have a very high performance and be very resistant to environmental conditions such as sunlight, heat, moisture, etc. Ink features are of utmost importance like Colour Choice, Fluorescent Inks, Metallic Inks, Metameric Inks, Magnetic Inks, Optically Variable Inks, and Colour Changing Inks etc. etc.

**Substrate Features:** The choice of substrate is very important as it has to be a very durable material resistant to tearing, withstanding crumpling and stable to environmental effects such as humidity. In a bid to overcome the menace of fake Indian currency notes, the Government has started giving serious thought to printing currency notes on polymer, a practice prevalent in Australia. "Australian notes are more secure against counterfeiting". Some of the substrate features are Paper Features, Watermark, and Threads.

**Design Features:** Many of the design features are built around precision printing that can be achieved by the highly specialised presses used in the production of bank notes. There are many types of design elements that can be worked into a bank note to give protection such as Rainbow Printing, Anti Copy Features, See through Features, Intaglio Detail, Latent Images, and Blind Recognition Features etc.

Security features of currency printing were always remained a confidential and sensitive issue. Currency notes were always counterfeited in the world irrespective of several security and legal features. Therefore, now-a-days it is very relevant study to study the security features and designing features for identification and acceptance of only genuine currency and this study will help in this direction. As it is a non-ending process in the present world, therefore such studies will always be relevant and helpful in future.

**Keywords:** *Fluorescent Inks, Metallic Inks, Optically Variable Inks, Anti Copy Features, Blind Features, Watermark, Intaglio, Currency Notes etc.*

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## I. INTRODUCTION

In the modern era of Printing Technology, currency printing is the abstract of all the printing applications. It's a rare art which cannot be printed without the application of sophisticated printing technologies. The various processes and mainly the security features preventing the counterfeiting of currency notes are discussed below:-

Most of the banknotes employ four types of printing processes :

- Lithography
- Intaglio
- Letterpress
- Silk Screen Printing

### Lithography

Lithography is used for most of the background printing and is the first to be printed. The resulting print is flat crisp and well defined. The litho component of the bank note has three colors, yellow, green and purple, and will therefore require three different printing plates.

### Intaglio

Generally the area on most notes where intaglio is the portrait, the borders and the denomination. Intaglio can be found on both sides of the note but generally more is seen on the front.

**Letterpress**

The letterpress printing process is responsible for putting an individual number onto each and every bank note. Letterpress printing is generally found on the front of the note.



**Silk Screen Printing**

Silk screen printing is occasionally used to print certain specialized security features. The silk screen printing process is achieved by pushing ink through a screen which has been imaged with a design. The screen looks rather like a stencil, with non image areas having a solid non porous coating and image areas of open screen.

**II. SECURITY FEATURES**

**A. Ink Features**

All the inks used in bank note printing offer a certain amount of security because they are not commercially available and hence not available to would be counterfeiters. The inks used have to have a very high performance and be very resistant to environmental conditions such as sunlight, heat, moisture, etc.

- **Colour Choice**

Many commercial reproduction methods have problems telling some colours apart for instance colour copiers tend to reproduce lime green as yellow. Thus the choice of colours in which a note is printed can provide quite a security element.

- **Fluorescent Inks**

Materials which fluoresce under ultra violet light can be added to most inks. They can be incorporated into a visible design element or an invisible design element (i.e. printed as a transparent feature). When viewed under ultra violet light all is revealed.

- **Metallic Inks**

Metallic inks produce a sheen effect when printed as compared to the matt effect seen with other inks. They are generally used in large areas of solid colour so that their effect is maximised. They offer good protection from colour copy counterfeiting.

- **Metameric Inks**

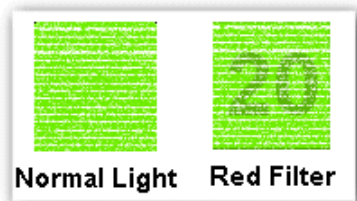
Metameric inks work on the principle of metamerism ....two colours matching under one set of lighting conditions can appear quite different under another set. Under normal viewing conditions nothing is apparent but when viewed under a red filter a numeral appears.

- **Magnetic Inks**

Magnetic inks enable areas of a note to be read by a magnetic detector. They are sometimes used for the letterpress component of the bank note, the serial numbers.

- **Optically Variable Inks**

Optically variable inks contain tiny flakes of special film which changes



note to be read by a magnetic detector. letterpress component of the bank

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colour as the viewing angle is varied. The result is an ink which has this same optical property, changing colour as the viewing angle is varied. They are very expensive inks and generally only used in small areas. They do however offer excellent protection against all counterfeiting methods.

- **Color Changing Inks**

Color changing inks is a chemical that changes color once viewed at a different angle. The color of the ink does not actually change, but the angle of the light to the viewer's eye changes and thus creates the change in color. Currently there are only two types, green to purple and gold to green.

**B. Substrate Features**

Substrate features are integral parts of the material on which the bank notes are printed. The choice of substrate is very important as it has to be a very durable material resistant to tearing, withstanding crumpling and stable to environmental effects such as humidity. In a bid to overcome the menace of fake Indian currency notes, the Government has started giving serious thought to printing currency notes on polymer, a practice prevalent in Australia. "Australian notes are more secure against counterfeiting". The notes are printed on polymer substrate instead of traditional paper.

*i. Paper Features*

For each currency produced a corresponding paper is manufactured. Banknote paper is made from cotton pulp which gives it better durability than commercial papers and a very distinctive feel.

*ii. Watermark*

The watermark is one of the most obvious security features of a paper banknote. When held up to the light an image can be seen in the paper, usually a portrait similar to that printed on the note. The image of the watermark is caused by the different thicknesses of paper, with light areas of the watermark being a result of thinner paper. A watermark is an excellent security feature.



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*iii. Threads*

Threads are embedded within the paper fibre effect, where the thread appears to weave in and out of the paper when viewed from one side. However when held up to the light the thread will always appear as a solid line. Features can be built into the thread material e.g. micro printing on fluoresce under ultraviolet light.



and can be completely invisible or have a star burst effect. Features can be built into the thread material e.g. micro printing on fluoresce under ultraviolet light.

**C. Design Features**

Many of the design features are built around specialised presses used in the production of bank notes. Others rely on the type of print that can be produced e.g. the tactile nature of intaglio print.

precision printing that can be achieved by the highly specialised presses used in the production of bank notes. Others rely on the type of print that can be produced e.g. the tactile nature of intaglio print.

There are many types of design elements that can be worked into a bank note to give protection such as :

**i. Rainbow Printing**

In our simple analysis of a banknote we saw that for each colour printed during the litho process, a different printing plate is required. However this is not strictly true! It is possible to divide the ink duct feeding the printing plate into sections and place different colours side by side. During the printing process the inking rollers oscillate and this leads to a natural blending of the colours. This is called rainbowing. Commercial printing presses are not designed for this type of procedure and hence rainbow printing not only adds aesthetic value to notes but also adds complexity to some counterfeiting techniques.

**ii. Anti Copy Features**

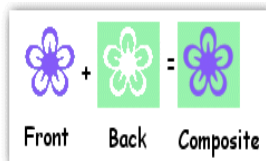
Anti copy features are generally composed of fine lines or dots and often have the word "VOID" or "FAKE" embedded within them. If copied these features are reproduced in a "distorted" form compared to the original, throwing up secret messages or interference effects.

**iii. See Through Features**

The precision equipment used to print back notes enables the back and front of the litho portions of the notes to be printed simultaneously. They can also be accurately registered to one another. A feature utilising this accurate registration capability is the see through feature. It comprises of 2 different images, one on the front and the other on the back. When the note is held up to the light a third image is produced by the combination of each image.

**iv. Intaglio Detail**

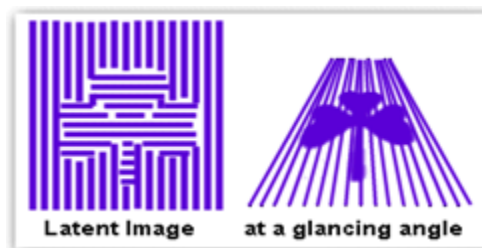
This is not strictly a design feature but intaglio images are initially generated is in itself is a security feature.



the hand engraving mechanism by which produces such tonal variety and detail that it

**v. Latent Images**

Latent images are produced by intaglio print and the protection they offer is directly a result of the tactile nature of intaglio print. When viewed straight on, a latent image reveals nothing but lines...and that is if you look closely! But viewed at a glancing angle an image appears. This is a result of the intaglio print occluding the paper and creating a contrast.



**vi. Blind Recognition Features**

It is often difficult for people with impaired vision to discriminate between one denomination and another and features have been developed to assist them. The features are often shapes printed in different colours. For example, a red circle might be used on a lower denomination, and a blue triangle on a higher denomination. Very often blind recognition features also have a tactile effect built into them.

**III. CONCLUSION**

Security features of currency printing were always remained a confidential and sensitive issue. Currency notes were always counterfeited in the world irrespective of several security and legal features. Therefore, now-a-days it is very relevant study to study the security features and designing features for identification and acceptance of only genuine currency and this study will help in this direction. As it is a non-ending process in the present world, therefore such studies will always be relevant and helpful in future.

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