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Evolution of POLYMER BANKNOTES

Pros and cons

by C S Jeena

Globally, many countries are shifting or opted polymer banknotes in place of paper bank notes for their increase shelf life, cost of production and improve security features. Recently, one of the world two biggest users of paper banknotes India and England had announced their plans to introduce polymer currency. The Bank of England (BoE) had announced plans to start printing money on polymer by next year, it has been issuing for more than 300 years. On the other hand, The Reserve Bank of India (RBI) is planning to introduce plastic currency next year on a pilot basis. The article analyses the brief history, pros and cons of polymer banknotes.

Introduction:

For hundreds of years, banknotes have been made from rag-based paper (Tang Dynasty A.D. 618-907)¹. The introduction of advanced technology based systems in the banking services world over resulted in great changes in terms of how financial institutions offer services to customers. Today, banknote issuers are faced with the challenge of increasingly sophisticated counterfeiting techniques and there are serious doubts that paper remains a viable material for secure banknotes. It's seems that paper currency is going the way of other objects/things (Tape-recorder, VCR's) that have become obsolete.

Recently, one of the world two biggest users of paper banknotes India and England had announced their plans to introduce polymer currency. The Bank of England's (BoE) inaugural polymer bill, a 5 pound note, will debut in 2016 featuring former Prime Minister Winston Churchill. On the other hand, The Reserve Bank of India (RBI) is planning to introduce plastic currency next year on a pilot basis. According to officials of BoE there were around 3 billion pieces² in circulation, while the officials of RBI estimated approximately 76.47 billion pieces³ in circulation. So far, Great

1. Paper history, journal of the International Association of Paper Historians, Volume 14, Year 2010, Issue 2

2. Counterfeit Bank of England Banknotes, <http://www.bankofengland.co.uk/banknotes/pages/about/counterfeits.aspx>

3. Currency Management in India: Issues and Challenges, (Keynote address by Dr. K.C. Chakrabarty, Deputy Governor, Reserve Bank of India at the Banknote Conference 2014, Washington on April 8, 2014), http://www.rbi.org.in/scripts/BS_SpeechesView.aspx?id=889



Fig. 1: The first polymer bank note. Special Bicentennial issue. Courtesy Reserve Bank of Australia

Britain is the world's biggest economy to announce a switch to polymer notes⁴.

What are Polymer Banknotes & how it started?

Polymer banknotes are banknotes made from a polymer such as bi-axially oriented polypropylene (BOPP). The first polymer bank note was issued in 1974 in Haiti and printed on Tyvek®, a synthetic fibre material, jointly pioneered by American Banknote Co. (ABNC) and Du Pont. Only Costa Rica and Haiti issued Tyvek® banknotes; test notes were produced for Ecuador, El Salvador, Honduras and Venezuela but never placed in circulation. Ten Years later in 1984, English printers Bradbury Wilkinson produced a version on Tyvek but marketed as Bradvek for the Island of Man with Tyvek® 1 GBP notes. These first plastic notes were printed on generic, white coloured substrate without windows or any other security feature. These first issues were

not successful, mainly because ink failed to adhere during circulation⁵.

How are polymer notes made?

A clear laminated polymer film (BOPP consisting of two laminated layers of 37.5 µm each) is the basis of the note. The film is made opaque (opacified) by the application of special inks, except for certain areas that result in clear windows or other features. Further, printing plates, polymer substrate, special inks and high technology printing machinery are brought together to produce the currency notes. Colourful background designs are printed simultaneously with both sides of the opacified polymer substrate using an offset printing process which results in a flat print.⁶

The first commercial success (See fig. 1)

The first successfully introduced a modern polymer banknotes note was issued in 1988 by the Central Reserve Bank of Australia (1988,

4. Bank of England signs up supplier for plastic bank notes
<http://uk.reuters.com/article/2014/03/12/uk-britain-boe-banknotes-idUKBREA2B0KT20140312>
5. Durable banknotes: an overview, Hans de Heij, De Nederlandsche Bank N.V.
6. http://www.rba.gov.au/Museum/Displays/1988_onwards_polymer_currency_notes/how_are_notes_made.html

Table: List of countries currently issuing Guardian, the denomination they issue, and the year they first used.

Country	First	Unit of Currency	Denominations
Australia	1988	Australian dollar	\$5, \$10, \$20, \$50, \$100
Papua New Guinea	1991	Papua New Guinean kina	K2, K5, K10, K20, K50, K100
Singapore	1991	Singapore dollar	S\$2, S\$5, S\$10, Commemorative S\$50 (1990), S\$20 (2007)
Brunei	1996	Brunei dollar	B\$1, B\$5, B\$10, B\$50, B\$100, B\$500, B\$1000, B\$10000, Commemorative B\$20 (2007)
Malaysia	1998	Malaysian ringgit	RM1, RM5, Commemorative RM50
New Zealand	1999	New Zealand dollar	NZ\$5, NZ\$10, NZ\$20, NZ\$50, NZ\$100 Commemorative \$10 (2000)
Romania	1999	Romanian leu	1L, 5L, 10L, 50L, 100L, 200L, 500L, 10,000L, 50,000L, 100,000L, 500,000L, 1,000,000L Commemorative 2000L (1999)
Vietnam	2001	Vietnamese dong	10,000 , 20,000 , 50,000 , 100,000 , 200,000 , 500,000, Commemorative 50 (2001)
Mexico	2002	Mexican peso	\$20, \$50, Commemorative \$100 (2009)
Chile	2004	Chilean peso	\$1000, \$2000, \$5000
Guatemala	2007	Guatemalan quetzal	Q1, Q5
Hong Kong	2007	Hong Kong dollar	HK\$10
Nigeria	2007	Nigerian naira	N5, N10, N20, N50, Commemorative N50 (2010)
Israel	2008	Israeli new shekel	NIS20
Nicaragua	2009	Nicaraguan cordoba	C\$10, C\$20, C\$200, Commemorative C\$50 (2010)
Paraguay	2009	Paraguayan guarani	G2000 G5000
Dominican Republic	2010	Dominican peso oro	RD\$20
Honduras	2010	Honduran lempira	L20
Vanuatu	2010	Vanuatu vatu	VT200, VT1,000, VT2,000, VT10,000
Canada	2011	Canadian dollar	\$5, \$10, \$20, \$50, \$100
Costa Rica	2011	Costa Rica colones	₡1000
Mozambique	2011	Mozambique metical	20MT, 50MT, 100MT
Mauritius	2013	Mauritian rupee	Rs25, Rs50

Source: www.innoviasecurity.com as updated on March 2014

ASD 10), printed on Guardian®, made by Securrency. It was printed on 'Guardian®', made by Securrency. Subsequently, in 1996 Australia switched completely to polymer banknotes⁷.

After Australia many other countries have introduced polymer banknotes, of which several have completely switched from paper to polymer. In 2011, Commonwealth Scientific and

Industrial Research Organisation (CSIRO) estimated that there are over thirty different denominations totalling some 3 billion polymer notes in service in 22 countries worldwide. According to Reserve Bank of Australia, "As of 2013 twenty nine (29) countries have issued polymer notes printed on Australian-made polymer substrates"⁸.

7. The world's first polymer banknote, <http://www.csiro.au/Organisation-Structure/Flagships/Future-Manufacturing-Flagship/Flexible-Electronics/World-first-polymer-banknote.aspx>

8. Exports of Polymer Notes, Reserve Bank of Australia, http://www.rba.gov.au/Museum/Displays/1988_onwards_polymer_currency_notes/export_of_notes.html

Why countries have opted polymer banknotes?

The main reasons countries have opted for polymer currencies are security and durability.

i) Security: These banknotes are tougher and more expensive to counterfeit than money printed on traditional cotton-based paper, and include new security features such as a transparent window, optical variable devices, shadow images etc. etc. A key feature is a clear window, which normally contains an 'optical variable device' that splits light into its component colours and is extremely hard to counterfeit. Plastic notes can also contain holograms.

ii) Longer life and durability: Plastic notes last much longer than cotton fibre-based paper ones. For instance, an Australian \$5 bill lasts about 40 months, against six months for a £5 note. According to Gerry Wilson of Australia-based Commonwealth Scientific and Industrial Research Organisation (CSIRO), the polymer notes have longer lifetime and can be produced at a faster rate than paper currency. They also stay spiffier longer because they're more dirt-and moisture resistant and are at least 2.5 times more durable than paper currency. This life increase is not caused by the polymer substrate, but also by the post printed varnish used on these notes – two different types to create a better grip for e.g. the use in ATMs. Countries like India can be benefited as, according to RBI on an average, 1 out of 5 paper note in circulation (over 20 per cent) gets disposed of

every year after getting soiled and the number of such soiled currency bills stood at over 13 billion units during the financial year 2011-12⁹.

iii) Economical in the long run: Although polymer banknote cost more they can be economical in the long run. The BoE estimates that printing the £5 and £10 notes on plastic, rather than paper, will cut production costs by a quarter, or £100m, over the next ten years¹⁰.

iv) Hygiene: Polymer notes are more hygienic as they absorb fewer bacteria, harder to tear or crease – making them easier for vending machines – and waterproof, even able to survive being put in the washing machine.

v) Environment friendly: Most of the paper based banknotes are 75% cotton – which takes large amounts of pesticides and water to produce. On the other hand, the base material of polymer is a non-renewable resource, but due to its recyclability, it has more than one life. For example, The Reserve Bank engaged the services of The Energy and Resources Institute (TERI) to conduct a study on the carbon footprint of cotton-based banknote paper substrate vis-à-vis plastic-based substrate and to estimate their overall environmental impact, taking into account their complete lifecycles. The Life Cycle Impact Assessment results for the two types of notes indicate that replacing cotton-based notes with plastic-based notes would have significant environmental benefits. Polymer/plastic banknotes (and the waste

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9. RBI gears up for plastic notes as 20% paper bills get soiled, *The Economics Times*, May 12, 2013.

10. Bank of England signs up supplier for plastic bank notes, *Reuters*, Mar 12, 2014.

from production) can be granulated and recycled into useful plastic products such as compost bins, plumbing fittings and other household and industrial products¹¹.

Some apprehensions?

Polymer banknotes have some disadvantages also, such as;

i) Environmental conditions:

The official said that the biggest concern over plastic currency was that it was never tried out in such extreme weather conditions like India. The extreme weather means that the notes have to survive temperatures over 40 degrees in some states and sub-zero temperatures in parts of the Himalayas and high level of humidity in parts of the country. In 1982 and 1983, the American Bank Note Company printed banknotes for Costa Rica and Haiti on DuPont's Tyvek® polymers. These had fairly limited release, but did circulate in each country. Additional trial and specimen banknotes were developed for Honduras and El Salvador. Unfortunately, in tropical climates, ink did not bind well to the polymer and the notes began smearing quite badly.

ii) They are harder to fold and more slippery, which makes them harder to count by hand.

iii) **Issue of recycling:** Some less developed countries may not have the facilities to recycle them - and when they burn they pollute the air.

iv) **High cost:** In addition, polymer notes cost more to

produce in the short-term, which could be a drawback for developing countries. The payback from their extra durability only comes over time.

v) Cotton banknotes stride forward:

According to polymer researcher Stane Straus, the security gap between paper and plastic notes is closing. It is now possible to make "hybrid notes" - paper notes with a transparent polymer window.

vi) Monopolistic situation:

The supply of, and the technology for producing, plastic currency are a big business for the Reserve Bank of Australia. Plastic currency is now used by 22 countries (approximately) around the world. But it is also apparent that Australian parties have been involved in bribing high officials in Malaysia, Indonesia and Vietnam (at least) in securing contracts for plastic currency. The Australian courts are apparently cooperating in some form of cover-up. That has become apparent from the Wikileaks release of a gagging order by the Supreme Court of Victoria at Melbourne where the court forbids¹².

Another factor could be the conservatism of central bankers. "Central banks are very conservative institutions," Stane Straus says. "People making the decision to convert to polymer - partially or fully - are taking a personal risk." Many central banks are simply waiting until others convert and then they will follow."

Further, not all central banks are convinced of the use of Polymer notes. The Central Bank of Bangladesh also decided to return to cotton paper after their experiences with a 10Taka polymer note. In June 2001, the Solomon Islands issued \$2 polymer banknotes, However they reverted to paper notes in 2006. Last year, The Central Bank of Nigeria (CBN) returned to paper currency from plastic which were introduced in 2009.

Today, approximately 22 countries use polymer banknotes, but only few have converted all denominations into plastic. One country that doesn't look like it'll be abandoning paper for plastic anytime soon is America. Last year, the Federal Reserve launched a new \$100 bill, the second most common bill in circulation after the \$bill with security features including 3-D security ribbon and color-shifting ink.

Conclusion:

It's almost 20 years since first polymer bank notes were introduced by Australia. In the future bank notes will be much used by automats like ATMs and banknote acceptors. From this prospective, polymer bank notes seems to behave better than cotton based banknotes. Feeding polymer notes into an automat is easier because such notes are less affected by tears, missing parts and clipped corners. Also from 'green' perspective polymer banknotes seems to have better performance when it comes to environmental and sustainability aspects.

11. RBI Annual Report 2013-14, Chapter VIII Currency Management, Plastic Banknotes carbon footprint.

12. <http://wikileaks.org/aus-suppression-order1press.html>.

13. Durable banknotes - De Nederlandsche Bank

14. Central Bank of Nigeria, www.canbank.org