

Australia's experience with polymer banknotes

■ Robert Rankin *Reserve Bank of Australia*

The Reserve Bank of Australia issued the first polymer banknote more than two decades ago and completed the conversion of all denominations to polymer in 1996. This article examines the Reserve Bank's experiences with polymer banknotes, highlighting the impacts of polymer on security and the efficiency of distribution of Australia's banknotes.

The impetus for polymer

The impetus behind the move towards a radically new type of banknote had its origins some 40 years ago when, in 1966, a new series of paper banknotes was introduced. This new series incorporated what were considered, at the time, to be state-of-the-art security features such as watermarks, embedded security threads, intaglio printing and coloured offset inks. Within one year, however, a number of high quality \$10 counterfeits were found in circulation. Although it was readily understood that the best an issuer can hope to achieve is to increase the cost and time that a counterfeiter allocates to producing a counterfeit banknote, the speed with which these counterfeits appeared was disturbing.

In response, the Reserve Bank established a 'think tank' comprising scientists from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's national research organisation, and the Reserve Bank with the purpose of identifying innovative approaches to creating substantially more secure banknotes. Flowing from this, the CSIRO proposed developing a plastic-based substrate as a platform for the next generation of radically different security features. By the end of the 1980s, the production issues that had been identified during this research phase had been resolved to the point where the Reserve Bank was able to issue the first banknote printed on the new polymer substrate.

Australia's first polymer banknote – a commemorative \$10 banknote celebrating Australia's bicentenary – was issued in 1988. It effectively served as a trial for the new substrate and featured a clear window containing an Optically Variable Device (OVD). Feedback obtained from circulation trials was generally positive, with cleanliness and durability seen as major advantages. However, there were some concerns raised by members of the public and professional cash handlers about the feel and handling of the banknotes. Further research suggested that these issues could be overcome with changes

to production (for example, more texture from intaglio printing and improved overcoating) and to banknote handling practices. In view of these changes and because polymer banknotes handle and process through some machines differently to paper banknotes, extensive pre-release testing was co-ordinated with banknote accepting/dispensing machine manufacturers. Encouraged by the success of the trials, the decision was taken to produce Australia's next series of banknotes on a polymer substrate.

A full polymer series

In July 1992, the Reserve Bank issued a \$5 polymer banknote, the first denomination of the new series. The final denomination in the new series, a \$100 polymer banknote, was issued in May 1996.

Despite the positive feedback to the commemorative banknote and the subsequent work undertaken to address the issues raised at the time, the initial response to the new banknotes was more negative than anticipated. Notwithstanding that much of the negative public comment was associated with the aesthetics of the new series design (and occurs whenever a new series is issued), objections were registered about the feel of the banknotes and a perception of handling difficulties. In regard to the latter, concerns were also expressed that the properties of the substrate made folding banknotes difficult and that this created storage problems.

The Reserve Bank worked closely with major cash handlers to identify and overcome these handling concerns. Specifically, 'user groups' with members of the cash handling industry were established to improve the dissemination of information on appropriate handling practices and to facilitate more comprehensive feedback on their experiences with the new banknotes. Minor adjustments in handling practices, such as the cessation of banknote folding, were integral to industry acceptance of polymer banknotes.

By the time that the last denominations in the series were issued in 1996, the industry had gravitated towards a preference for polymer. This preference for polymer is now entrenched. In a survey of suppliers of banknote validators in 1998, more than 80 per cent said that their machines were

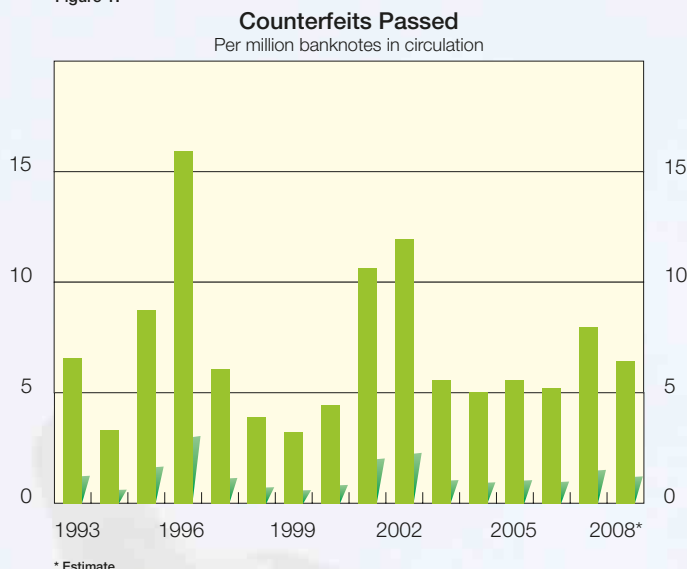
more efficient following Australia's move to polymer banknotes with less maintenance required and fewer errors. None of the suppliers that participated in the survey said their machines were less efficient.

Security

The primary motivation for adopting a polymer substrate was to increase banknote security and thereby offer greater protection against counterfeiting. Initially it was expected that the additional security would be achieved by incorporating OVDs into the banknotes similar to the OVD used in the 1988 commemorative banknote. This feature proved to be less durable than originally expected, however, and was not included in the new polymer series. Instead, the Reserve Bank formed the view that the clear windows, combined with embossing, provided the significant improvement in the level of security that was required.

In the period since the Reserve Bank introduced the new polymer series, there has been a proliferation of affordable printing, scanning and graphics technologies that has seen counterfeit rates increase globally. Despite this global trend, the counterfeiting rate in Australia has tended to stay relatively low especially in comparison to rates experienced in other countries (Figure 1). Indeed, in the year to December 2008, about 6,400 counterfeits were detected with a nominal face value of around \$350,000. This represents around 6.5 counterfeits detected per million genuine banknotes in circulation. Importantly, almost all of the counterfeits detected in Australia are of poor quality, are printed on a paper substrate and are easily identified by feel as well as on visual inspection.

Figure 1.



One benefit of having very low counterfeiting rates relative to historical trends and relative to overseas experiences is that there has not been the same pressure as in other countries to upgrade the banknote series with enhanced security features or to introduce a new banknote series. Notwithstanding this, considerable research has been undertaken into a new generation of security features that take advantage of the unique properties of the polymer substrate.

Durability

The conversion to a polymer substrate has also provided a considerable benefit in terms of the durability of Australia's banknotes which, in turn, has realised considerable cost savings for the Australian public. Despite the number of banknotes in circulation doubling over the past twenty years, Australia currently produces less than half the number of banknotes than it did before the introduction of polymer banknotes (Figure 2). Considering that a significant proportion of production in the past few years has been associated with establishing larger contingency reserves, this implies that the average life of polymer banknotes is more than four times that of paper banknotes.

The increased durability of polymer banknotes is a consequence of a number of factors:

- the non-porous and non-fibrous nature of the substrate means that the banknotes do not absorb moisture;
- being non-fibrous, the substrate does not physically break down or go limp with repeated folding; and
- the toughness of the polymer substrate makes it more difficult to initiate a tear than on paper (although, once initiated, a tear can propagate very easily).

Processing machine adjustments

At the time that polymer banknotes were introduced in Australia, the Reserve Bank used Currency Verification Counting and Sorting systems to process banknotes that were repatriated from circulation. Some minor adjustments to the systems were required to deal with polymer banknotes. These included adjustments to the voltage of the strapper heat sealing mechanism to prevent damage to banknotes being strapped, more precise humidity control to assist with static management, a reduction in air supply to the banknote feeder to prevent lighter polymer banknotes lifting and manual air separation of the banknotes prior to feeding. These systems were successfully replaced with BPS 1000s in 2004, highlighting that polymer banknotes can be processed successfully on different manufacturers' platforms.

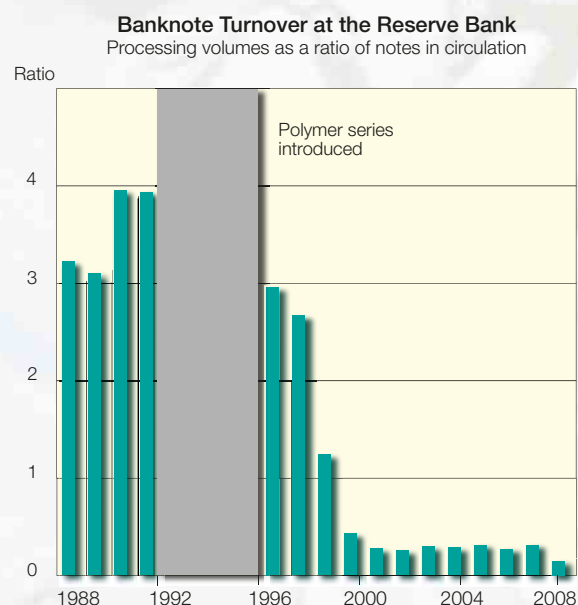
When polymer banknotes were introduced, there was an expectation that the primary means of determining the fitness of the banknotes would be through the detection of mechanical defects (ie. tears, holes, tape, missing pieces). The substrate proved to be so resilient, however, that it became clear that it was mainly the degree of inkwear that determined the fitness or otherwise of the banknotes and hence it was necessary to be able to detect different levels of inkwear as well as substrate defects. Consequently, the Reserve Bank commissioned an Australian company to develop an inkwear detector for the processing systems. When the Reserve Bank replaced its systems, the manufacturer of the BPS 1000, Giesecke & Devrient, successfully developed a new inkwear detector as well as a closed tear detector.

Changes to distribution arrangements

The improved durability and security of Australia's banknotes have also been a catalyst for significant changes to the banknote distribution system.

The introduction of polymer banknotes provided an impetus to introduce significant efficiency improvements to the cash distribution arrangements in Australia. These included the privatisation of the banknote pools, the centralisation of the Reserve Bank's cash processing and distribution activities to the National Note Processing and Distribution Centre and the establishment of a Note Quality Reward Scheme that provides significant incentives to the industry to invest in fitness sorting infrastructure¹.

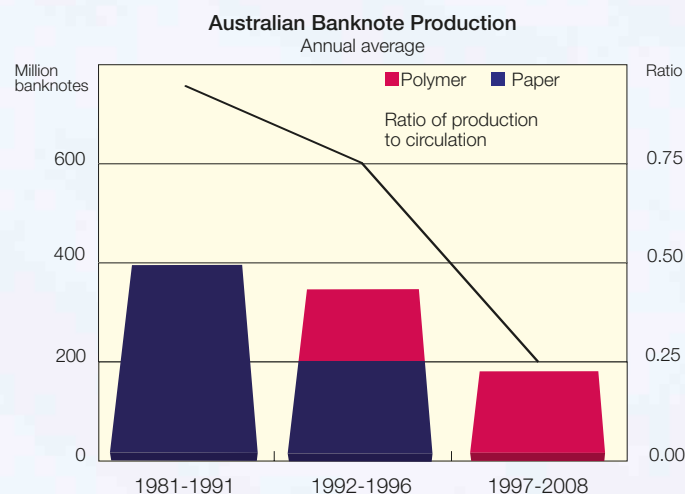
Figure 3.



Conclusion

The Reserve Bank's experience with polymer banknotes during the last two decades has been overwhelmingly positive, especially with regard to maintaining low levels of counterfeiting, a high quality of banknotes in circulation and a high level of efficiency in the banknote distribution system.

Figure 2.



With the introduction of polymer banknotes, examination of banknotes for fitness and authenticity by the Reserve Bank no longer needed to occur as frequently as it had for paper banknotes. In the absence of changes to the distribution system, however, the repatriation rates of banknotes to the Reserve Bank remained higher than was necessary, resulting in excessive processing of banknotes by the Reserve Bank (Figure 3).

1. See the article by Michael Andersen from the Reserve Bank of Australia titled "The Note Quality Reward Scheme", published in Issue 3 of BILLETARIA in March 2008.