POLYMER BANKNOTE: TWO YEARS OF BRAZILIAN EXPERIENCE

BANCO CENTRAL DO BRASIL
Currency Management Department

INTRODUCTION

On 24.4.2000 Banco Central do Brasil issued a 10 Real commemorative banknote made of polymer, with the aim of running a circulation test of the banknote. The test is foreseen to last four years and it will assess the wearing-out of the banknotes under Brazilian environment, as well as its acceptance by the public and the attempts of counterfeiting the banknote.

Moreover, the need to reduce expenses led Brazilian Government to pursue solutions featuring better cost-benefit analyses. Therefore, Banco Central do Brasil tried to join together higher security and improved durability of a printed banknote.

FIRST PERFORMANCE INDICATORS OF THE CIRCULATION TEST

A total of 11,794,129 banknotes were put into circulation at issuing time. However, given strong fiscal adjustments under way in Brazil in 2000, the flow of further issues was reduced, and only in December 2000 the amount of banknotes in circulation – 88,707,000 banknotes - reached a level that enabled normal circulation. Immediately after the issuing day, it was noticed that people were hoarding the banknotes, a fact that was anticipated by the Currency Management Department and ascribed to the commemorative character of the issue and the novelty of a plastic banknote.

In December 2001, there were about 201 million banknotes in circulation, almost the total quantity planned for the circulation test – 250 million.

After one year in circulation, we began to assess the performance of the banknote. Some of the results that have already been obtained are described below:

ACCEPTANCE BY THE PUBLIC

Since the issue of the commemorative banknote on 24.04.2000, there have been no problems of acceptance.

Two opinion polls were conducted, the first in October 2002 and the second on December 2001. At the first poll a total of two thousand people were interviewed in all regions of the country, including the capital cities and other cities. The purpose of the poll was to assess the perception of the population regarding the banknote, as well as its first impression on the new material used.

In the second survey, with the purpose of assessing the performance of the banknote with the population who works handling money, the Currency Management Department decided to widen the scope of the survey and interviewed the public in general, bank tellers and shop cashiers.

Survey with the population.

The results suggest that most of the population finds the bill good or excellent (80% in 2001 and 89% in 2000).

In 2001, 75% of the individuals interviewed thought the polymer bill better than its paper counterpart (85% in the 2000 survey).

Sixty-one percent of individuals interviewed rank the polymer bill as more difficult to falsify due to the plastic material of its make. The main advantages of the polymer bill, as seen by the population, are:

DESCRIPTION	2001	2000
Resistance to tearing	42%	28%
Resistance to moist /wear /fading	42%	26%
More durable/resistant	38%	31%

The main disadvantage, mentioned by 9% of individuals interviewed, was the tactile feeling, given by the plastic, that the bill is too smooth, thin and easy to loose.

Survey with bank tellers and shop cashiers

One thousand individuals were interviewed in the main metropolitan regions of the country, including taxi drivers (58%), shop cashiers (42%) and bank tellers (25%).

In general, the plastic bill was regarded as excellent (10%), good (31%), regular (21%), bad (17%) and very bad (20%).

Fifty-two percent of individuals surveyed, mostly bank tellers, thought the polymer bill worse than the paper bill. The reasons pointed out by the tellers were that the bills tend to stick to each other and are difficult to count/handle.

The 36% of individuals interviewed that thought the polymer bill better than the paper bill said that they consider it to be more durable/resistant (43%) and harder to tear (33%).

Seventy-five percent of individuals surveyed think the polymer bill harder to be forged.

EVENTS OF FORGERY

After 32 months of the introduction of the commemorative banknote, 8,099 events of falsification were recorded (0.003% of a total of 253 million polymer bills in circulation). These reproductions were made on ordinary paper, using jet-ink printers and feature simulations of the complex window and metallic filter (86% of total counterfeits examined). In order to make these two elements of security, a thin auto-adhesive plastic film was used, and the metameric filter made with a colored plastic glued on the transparent one. These forgeries failed to have simulations of watermark or of magnetic thread, and the print of lines and edges was poorly defined.

PHYSICAL CONDITION OF BILLS IN CIRCULATION

After two years since the launching of the polymer bills and completed their production – 253 million bills – the Currency Management Department started the second phase of the circulation test, when bills that return from circulation are analyzed.

For this purpose, a computer program was implemented in May 2002 to record information collected on the physical condition of the polymer bills that are subsequently contrasted with data related to the issue (date and place) in order to follow the bill's useful life.

Selection of bill samples for evaluation.

The following criteria for collection of samples were set in order to evaluate all bills returning from circulation:

(1) defaced bills: (bills disfigured by heat, cut, torn, scratched, crushed, dirty or defective, delivered by the public or by commercial banks);

- Analysis and recording of physical condition of 100% of bills, in each Central Bank's branch.

(2) unusable bills: (wear-down bills sent by banks, separated from other bills in good condition);

- Analysis of 300 bills of the weekly volume, recording the bills' serial number and physical condition (in each Central Bank's branch);

(3) bills classified as "to be selected": (bills in good conditions received daily from commercial banks in the ordinary course of operations);

- Selection of 300 bills of the weekly volume, (in each Central Bank's branch), before the automated processing. Analysis of physical conditions, separation of bills in good condition and unusable, classification and recording by physical condition with the respective serial number. Bills in good condition return to circulation while those in poor condition are stored. Later, such bills will follow to deletion. All such records are made within the same month in which the bills are gathered.

Classification of bills by physical conditions

Nine levels of wearing have been defined, based on the physical condition of Brazilian bills that come back from circulation, based on Australian bills with different levels of wearing, since that is the only country to be using polymer bills for some time:

(a) Bill in good condition – level 1.

Bill in conditions to go back into circulation; new or practically new;

(b) Bill in good condition – level 2.

Bill in conditions to go back into circulation; but displaying slightly worn-out ink (body of the bill) and/or transparent window;

(c) Bill in good condition – level 3.

Bills in good conditions, still good to go back into circulation; but displaying worn-out ink (body of the bill) and/or transparent window;

(d) Worn-out bill – level 4a.

Bill severely worn-out at the transparent window, loosing its parts;

(e) Worn-out bill – level 4b.

Bill severely worn-out at the body of the bill, with loss of ink and displaying whitish areas, affecting the view of parts of the drawing;

(f) Worn-out bill – level 4c.

Bill severely worn-out both at the transparent window (with loss of its parts) and at the body of the bill (with loss of ink and whitish areas), affecting the view of parts of the drawing;

(g) Worn-out bill – level 4d.

Bill severely worn-out in the serial number and seal areas, with loss of ink and whitish areas;

(h) Worn-out bill – level 5.

Bill strongly worn-out in its body, with significant loss of ink, displaying whitish areas. The window may be either severely worn-out or in good condition;

(i) Worn-out bill – level 6.

Bill strongly worn-out in its body, with big loss of ink and definition in the drawing of the bill, large whitish areas. The window may be either severely worn-out or in good condition. When handled the bill will feel as loosing rigidity;

In addition, the following criteria were defined to classify damaged bills:

(1) bills disfigured by heat: burn or creased;

(2) cut, thorn bills: cut, bored or ripped bills. Bills mended with adhesive tape or otherwise;

(3) creased bills: severely creased or furrowed bills;

(4) dirty bills: bills darkened by spots of ink, grease, chemical substances or bills having their printing removed by chemical products;

(5) scratched bills: bills containing scratches, inscriptions or drawings;

(6) bills showing defects of manufacture (printing and cutting).

Quantity of unusable bills.

Over the 32 months of circulation, the Central Bank recorded 468,143 unusable bills (0.18% of total issued bills – 253 million), including bills damaged on purpose and by normal wear. Most of the bills returning from circulation remain in good condition, the number of bills worn-out by normal use corresponds to 0,6% of unusable bills. Among damaged bills, the most part was damaged by cuts (86%) and action of heat (8%), giving the impression that the population was testing the strength limits of the bill.

Automated processing of polymer bills in Brazil

In April 2001, one year after the bill was introduced, the Central Bank started to receive the polymer bills in deposits made daily by banks. The establishment of such date was made by two reasons: first, for a difficulty found by the manufacturer of the DLRS 3530 and DLRS 5000 – a somewhat old equipment and, as such, difficult to make adaptations – used by the Central bank in adjusting them to processing the new bills; and second, the fact that the Currency Management Department was performing a circulation test, leading to a requirement to keep the bill in circulation for the longest time possible.

The Central Bank of Brazil currently has 19 DLRS 3530 machines – which do not process polymer bills because adjustments proved impossible –, and three

DLRS 5421 and 10 DLRS 3700 (installed in October 2002), which process the polymer bills.

Since April 2001 about 75 million polymer bills have been processed, with the following results:

Description	2001 Monthly Average	%	2002 Monthly Average	%
Processing	2,477,522	100%	6,909,323	100%
Fit	2,388,256	96.4%	6,680,571	98.1%
Unfit / Rejected	31,023	1.3%	85,034	1.2%
Suspected	58,243	2.4%	43,718	0.6%
Counterfeit (total)	17	0.0%	7	0.0%

* Data till December 2002

The expressive number of banknotes classified as unfit, rejected and suspected reflects the need for further adjustments to the DLRS 5421, since a manual inspection of those banknotes revealed that only about 5.7% of them were really unfit.

Based on information provided by the Central Bank of New Zealand, which also operates DLRS equipment and processes polymer banknotes since 1999, suggests that the percentage of unfit and rejected banknotes should be under 1% of the total banknotes processed, mainly because of the physical condition and span of time in circulation of the Brazilian banknotes.

Up to now no banknote has been destroyed, since the Currency Management Department is visually analyzing samples of banknotes classified by the equipment as unfit. We plan to destroy the banknotes in processing and shredding equipment. The same equipment used to destroy paper banknotes. We are also contacting Brazilian corporations interested in collecting the residues of destroyed banknotes to recycle the plastic.

The processing of polymer notes in DLRS 3700 equipment is very recent. We installed the machines between October and December 2002. The figures shown bellow signed also a high quantity of notes classified as unfit and rejection. Although some adjustment still be necessary, the major part of the unfit notes are worn-out by use. The main cause for rejection is the folded corners.

POLYMER NOTES PROCESSED AT DLRS 3700 (oct to dec/2002)

	monthly average 2002	%
NOTES PROCESSED	6.272.368	100%
FIT	6.033.611	96,2%
UNFIT + REJECTED	238.758	3,8%
SUSPECTS	-	0,0%
FALSE	6	0,00010%

Processing by banks

The automation of banking procedures has significantly been increased in recent years, although the quantity of automatic equipment installed in Brazil is still

small, if compared to that in the United States and European countries, especially if we take the country's territory into account.

There are about 19,800 ATMs and 57,600 cash dispensers and deposit stations installed in the country. Many of these machines can process both polymer and paper banknotes with reasonable efficiency. In order to operate with polymer banknotes, equipment with conveyor mechanisms based on friction needed an adjustment to handle the banknote thickness, while those based on vacuum required no adjustments, as reported by their producers.

Sorting and counting equipment – which are small machines – can process polymer banknotes with no problem. There are fewer transport incidents when they process polymer banknotes than paper banknotes. Moreover, there is also less deposit of residues (paper dust from the banknotes) in their internal mechanism.

It was observed that some few processing incidents were caused by incorrect packaging of polymer banknotes, that is, the wrapping rubber/paper band was too tight. These bands may cause creases and edge folding and due to the memory effect of the polymer these factors make the entry and conveying of the banknotes difficult.

RECYCLING

Regarding the recycling of polymer notes, we performed a trial of recycling using residue of polymer sheets and also defective printed polymer sheets destroyed in

the Brazilian Printing Works. A Brazilian plastic industry processed this polymer residue, add black pigment and produced these products: pail, spade and nailers.

CONCLUSION.

The initial results of circulation tests suggest good acceptance by the public, despite the resistance observed among bank tellers, which we believe may be reverted.

However, the decision whether adopting or not the polymer for the Brazilian banknotes will depend on the results obtained at the end of the testing period, which shall extend until 2004.