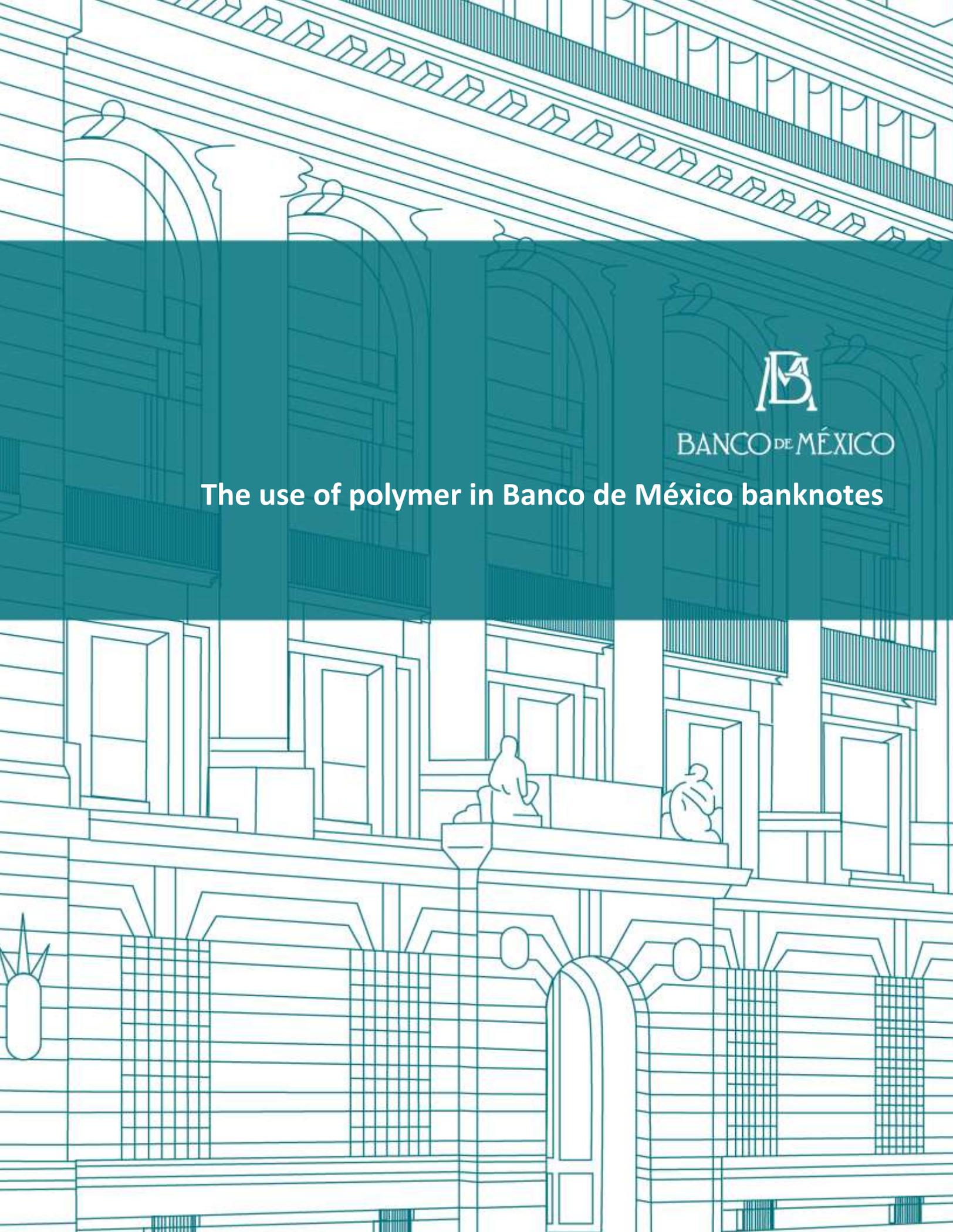




BANCO DE MÉXICO

The use of polymer in Banco de México banknotes



CONTENTS

Background	1
Cost-benefit study	1
Semi-industrial tests and production feasibility	2
Circulation test	3
Surveys	3
Polymer banknote processing.....	4
Counterfeiting	4
Concluding remarks.....	5

Background

Banco de México's interest in polymer substrate dates back to 1996 when the Banco de México began experimenting with substrate options available at that time. Three substrata were analyzed, one of them is called DURANOTE (produced by Akro-Mobile), consisting of the union of two layers of polymer, another called LUMINUS (produced by Domtar), consisting of a thin layer of polymer covered on both sides by cotton layers, and a third called GUARDIAN (produced by Securrency), consisting of a polymer with perpendicularly distributed monomers. Laboratory tests were applied to all three substrata and printing tests to two of them; the GUARDIAN was chosen from the first study for additional tests.

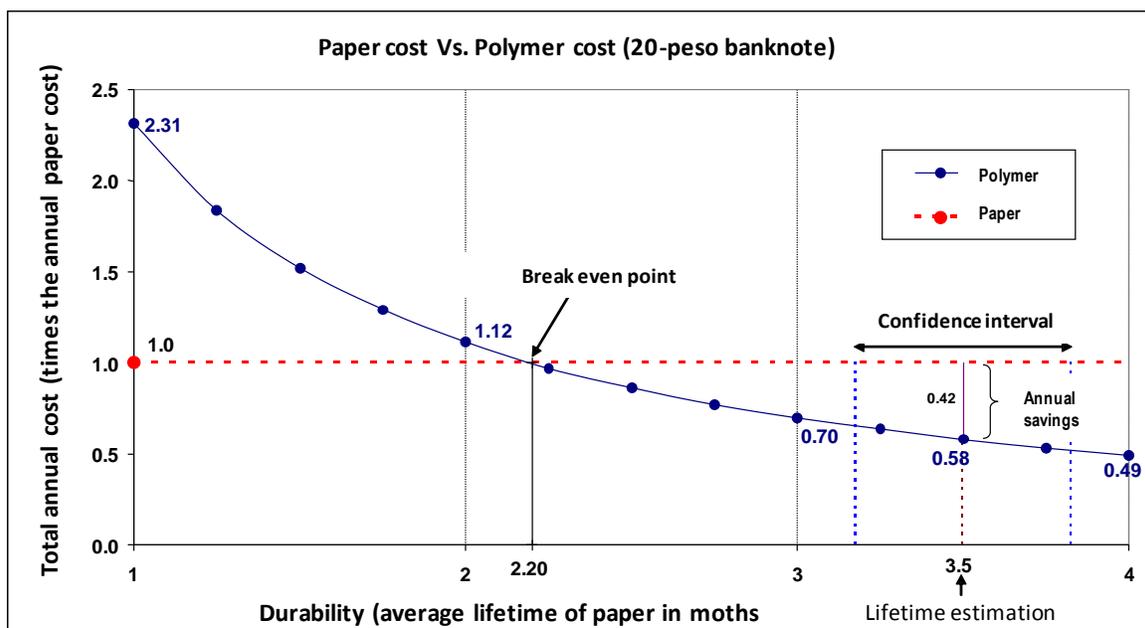
Looking for increasing the durability and in particular, the quality of the Mexican lowest denomination in banknotes (20 pesos), in 2000 Banco de México carried out a research on the viability of polymer substrata.

The Bank's decision about researching on polymer raised many questions: Would polymer banknotes last longer than paper banknotes in Mexico?; Would they be effective against counterfeiting?; Would the public accept them?; What would the Banknote Factory require to be able to use this substrate?; What processing problems might it encounter?; Could automatic teller machines handle polymer banknotes?; How would commercial banks view them?; And, What costs and benefits would it bring to the Mexican society? As polymer banknotes implied a significant change for society and the financial system, the Central Bank came up with a project consisting of the following stages: a cost-benefit study, a semi-industrial printing test at its Banknote Factory, a nationwide circulation test, an evaluation using focus groups, and national surveys of the public, cash processors and commercial banks. The results would then be presented to the Board of Governors for approval..

Cost-benefit study

A cost-benefit analysis was performed on the basis of direct production costs, estimated productivity reduction, distribution and finishing costs. The analysis showed that if the polymer's lifetime was at least 2.2 times the average lifetime of the corresponding paper note, the project would be economically viable (see graph 1).

Graph 1 Cost-benefit analysis



The average lifetime of the polymer banknote was finally estimated to be 3.5 times that of the paper banknote, and it was estimated with 95 percent reliability that the average lifetime would be between 3.2 and 3.8 times that of paper, resulting in an annual saving of 42% with respect to a scenario in which the same amount of paper banknotes were kept in circulation. Thus, the average lifetime of the 20-peso banknote increased from 8.3 months to 28.8 months..

Semi-industrial tests and production feasibility

The Bank performed printing tests using the “GUARDIAN” substrate which produced important results in terms of polymer performance in printing machines. Besides differences in the performance of the substrate in the printing machines, polymer banknotes must be varnished, a process which had to be modified to take account of Mexico City’s height of more than two thousand meters above sea level which affects how varnish dries. These technical problems which arose during the printing tests were all resolved, and so the project remained economically viable.

The strategy that Banco de México used was to polymize a denomination instead of replacing it; the difference is that by polymizing, the previous design is, as far as possible, retained, such that the new banknote belongs to the family of notes already in circulation, whereas with replacement you are free to redesign the banknote. When the 20-peso denomination was polymized, the plates printed differently depending on the substrate, basically because of the difference in absorption. As a result changes had to be made to the thickness and distance between the design lines in order to produce a banknote similar in appearance to the paper one.

Besides design changes, the adjustment to the varnishing process gave rise to two problems during the printing process: the first was “blocking”, which consisted of the printing pages sticking together, and the second was the physical handling of the polymer resins which proved to be very different to paper. Solutions were found to all of the issues, so enabling the project to remain viable.

Circulation test

The circulation test began in September 2002 and had two fundamental characteristics. Firstly, the test was nationwide which was important in a country like Mexico with big variations in weather conditions and customs regarding the use of banknotes. Secondly, all outstanding banknotes were quickly and completely replaced. In order to achieve this, Banco de México created a denomination inventory so large that within 8 months it had virtually replaced all banknotes in circulation (200 million) As a result, the entire population immediately became familiar with the new banknote and its use, and the average lifetime was not distorted by the presence of two different substrata.



Surveys

The decision to change a banknote’s substrate is not easy, as it entails many technical, economic, cultural, and even political issues. For an idea of the cultural impact of such a decision, opinion studies were conducted as well as surveys of the general public and financial sector.

One year after the circulation test began, a survey was conducted in 2,200 homes in towns with a population of more than 50,000. Among the more interesting replies to the questions we can cite the following: If you could chose between a 20-peso coin, polymer banknote or a paper banknote, Which would it be? 59% of the population said they preferred a polymer banknote, 22% a paper banknote, and 18% a coin. Likewise, in response to the question: Would you like another polymer-printed denomination? 68% of the population said yes and 31% said no.

Fifteen days after the test began another survey was conducted. This time, among the banking sector represented by bank cashiers, processing company staff and commercial bank staff. In

response to the question: How would you evaluate the polymer banknote compared to the paper banknote? the majority said it was cleaner (92%), of better quality (64%) and more durable (94%). However, in response to the question How would you compare its processing? the majority said it was harder (45%), slower (23%) or the same (15%). Despite this greater difficulty in processing banknotes, the financial sector had an overall positive view, and also recommended that another denomination be printed in polymer.

Polymer banknote processing

Paper and polymer banknotes deteriorate differently: while the former deteriorate when they become dirty, the latter deteriorate when the ink fades or they become scratched. This difference poses a challenge in the initial stages of polymer banknote issuance because the Central Bank has to create a new standard for “fit” and “unfit” banknotes.

In Mexico’s case, the standard was defined using 10 banknotes with progressive levels of wearing, from a new banknote to a completely worn one. Initially banks were given photos of worn banknotes produced in a laboratory. After a couple of years, the range was large enough for distributing to banks.

Deposits of worn banknotes changed in two main ways: the total number of banknotes received considerably decreased while the percentage of torn banknotes in such deposits rose.

Off-line destruction became slower, but the amount of banknotes requiring destruction notably decreased.

For Banco de México, the change in the substrate did not implied any additional staff in the factory or cashier area. While productivity decreased in some processes, it was more than offset by a reduction in manufactured or processed banknotes.

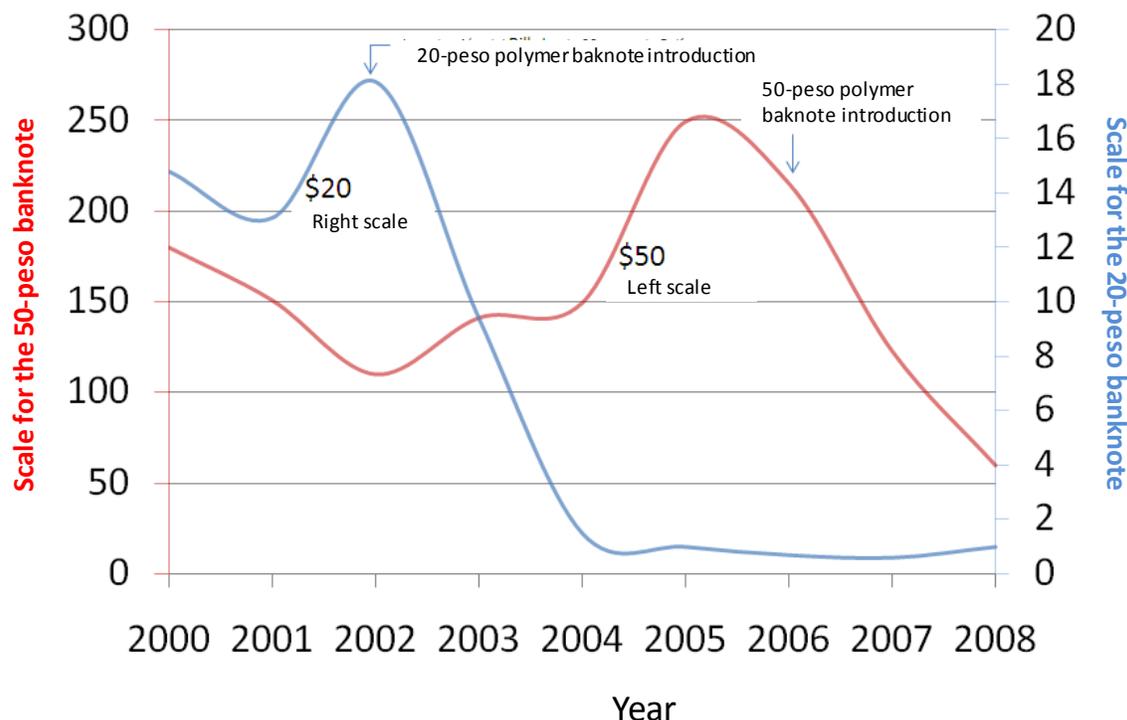
The polymer banknote’s longer duration brought the additional benefit of Cashier area savings due to a smaller banknote flow (reduction in commissions, transportation and insurance).

One of the changes implemented concerned the packaging system. Shrink-wrap plastic was previously used and, as the Bank suspected that cash processors opened the packages with knives leading to cuts on banknote edges which would then become scratches, the packaging system was changed.

Counterfeiting

As mentioned earlier, the main reason for the introduction of the polymer banknote in Mexico was to lengthen the average lifetime and improve the quality of banknotes in circulation. While the number of counterfeit banknotes detected annually in the 20-peso denomination was not high, a significant decrease was observed in subsequent years (see graph 2) such that in the six years the 20-peso polymer banknote has been circulating very few counterfeit notes have been detected.

Graph2. Number of counterfeit banknotes for each million in circulation



In November 2006 the 50-peso polymer banknote was issued. As in previous years, that year the 50-peso denomination was the most counterfeited banknote in absolute terms. However, the year after the polymer note was issued it became the third most counterfeited banknote and in 2008 the fourth most.

Polymer has become a strong barrier to counterfeiters in Mexico.

Concluding remarks

While the adoption of the polymer substrate has been a complex and involved process, for Banco de México and society in general it has proven beneficial. The Bank currently issues banknotes that are cleaner, more affordable, environmentally-friendly, and apparently more secure. A publicity campaign played a key role in introducing the product to the general public and knowing what users expected of it. A working group was also maintained with the Mexican Bankers Association to address people’s concerns



BANCO DE MÉXICO

www.banxico.org.mx