

B T R

ISSUE
04.18

BANKNOTE TECHNOLOGY REPORT

CONTENT

KURZ
CRANE CURRENCY
CCL SECURE
KOMORI
ARJOWIGGINS SECURITY

With special reports from...



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Research

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The Banknote Technology Report is a platform where the latest technological developments and features are centralized on a regular basis.

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KURZ

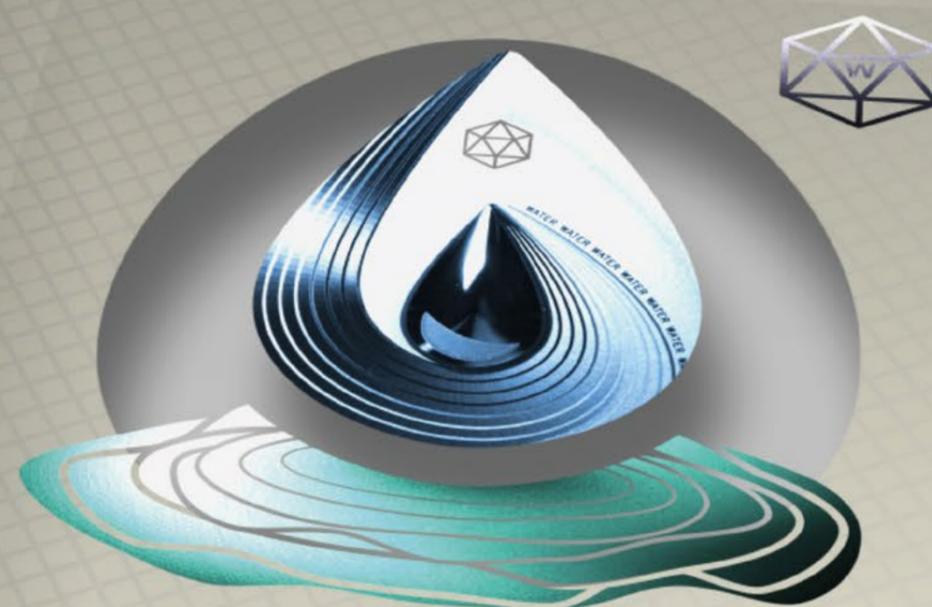
APPLIED FEATURES – FROM THE INNOVATIVE TO THE ESSENTIAL

KURZ 

Applied Features – From the Innovative to the Essential

KURZ

In many cultures, including ancient Greece, people believed that everything on earth is made from one of the four classic elements – air, water, earth, and fire. The theory first evolved around 450 BC and developed further over the centuries, becoming an important foundation for philosophy, science and even medicine. Sometimes the elements were not considered as substances, but rather as energies or sensory experiences. The Chinese theory of elements, Wǔ Xíng, added one important matter. Metal, jīn, is completing the theory and bringing it to perfection.



KINEGRAM® APL
with FLUX Effect and
KINEGRAM COLORS®

In the banknote industry, we use the term “element” to speak about security features, of which there is an abundant choice. Standing out from the crowd, foil based surface applied features have become a major element in the fight against counterfeiting. To this day, foil based security features were available in four different application formats – the four classic elements, so to say. These application formats are:

- Patch,
- Continuous Stripe,
- Registered Stripe, and
- Registered Window Stripe.

Windows are on the verge of becoming a mega trend in banknote security, not least after their prominent addition into recent polymer notes as well as their use in the new 20 and 50 Euro banknotes. In the case of the Euro, they have already begun to show a clear trend in reducing the number of counterfeits. Foil-over-window features in banknotes are both extremely eye-catching and easily used by the public, as well as widely trusted. The 2017 DNB study on Euro security features impressively demonstrated this.

At KURZ, we believe that windows will be an essential characteristic of banknotes in the future. However, the options for central banks who wish to use windows are limited to this date. Either, the bank is obliged to use a certain substrate such as polymer, or to have the foil over the window applied in the paper mill instead of the print works. The latter confines the design to use a stripe application format.

Therefore, we also believe that it is about time to end this limitation. Following years of groundbreaking development

work, with the support of several industry partners, nothing less than a revolution in foil application technology was achieved. The new technology, called KINEGRAM® APL, completes the items of choice for customers and brings foil application to perfection. With KINEGRAM® APL, foil will truly become the essential element of banknotes.

For the first time ever, banknote printers are in a position to create window features for paper banknotes in their very own premises, thus retaining both process control and value creation. To date, a die- or laser-cutting process in a roll-to-roll process was necessary for the creation of windows. This can be done in the paper mills, where after the window cutting, the foil is applied onto the substrate.

The patented KINEGRAM® APL, which stands for Applied Patch Label, is an additional option of how to create window banknotes, in a novel but fully tested way:

In a classic hot stamping process, and using any of the industry standard hot stamping machines such as an OptiNota H (KBA NotaSys), a FSA Foil Commander (Gietz) or a Foiljet FBR (Steuer), a laminate patch is transferred onto the windows in the printing sheet. The windows are created either in a separate step or in an inline process before the foil application. The carrier is removed as usual, cleanly separating from the laminate patch, which is now sealing the banknote window. Unlike window stripes, the KINEGRAM® APL patch does not require a stabilization (for consistent stacks of work and efficient sheet feeding) by a printed primer or a reverse side foil. The APL has only a slightly higher thickness than standard



hot stamping foils and acts both as a security device as well as a protective cover for the window, sealing it against mechanical wear and soiling.

With this important innovation, which completes the available possibilities for using window features, full freedom of choice is given to central banks. Wherever this would be desired, printing works are empowered to create features that they have previously been unable to access.

The printers are in the driver's seat when it comes to value creation and full process control. The technology also gives lots of freedom to banknote designers, not only in positioning the patch in the overall banknote design, but also in the combination of window and foil. It is possible to use any geometric window shape for the aperture in the banknote.

The application of KINEGRAM® APL foils has been successfully tested multiple times under industrial

production conditions for both types of foil application machines that are currently being used by printers, i.e. both rotary and up-down machines. In each case, the trials were able to reach real-life banknote production speeds. All the tests have been conducted without reverse side stabilization, both with double side intaglio and one-side intaglio. While additional trials are still being carried out with regards to stamping geometries, the technology is already available for industrial use.

The durability of KINEGRAM® APL foils has also been extensively tested and optimized. The physical properties and circulation strength of the patches have been engineered to comply with the most rigorous industry standards, including the existing durability requirements for window banknotes and using the Euro as a benchmark. The technology is highly durable and performs well in all circulation conditions.



A KINEGRAM® APL foil can make use of any optical technology to create security effects. At the BANKNOTE Conference 2018, KURZ is unveiling their latest series of house notes called “The Essential Element”, showcasing four different types of such APL varieties. Customers will be able to experience a combination of KINEGRAM® fine line partial metallization (where the metallic image and the optical security effects are in perfect register) in combination with KINEGRAM COLORS® technology. A second new house note uses a KINEGRAM® APL with the novel FLUX movement effect and KINEGRAM COLORS® technology. In a third variety, the patch contains a finely detailed image created with the innovative KINEGRAM® HDM (High Definition Metallization) technology. On the reverse side, an entirely different diffractive optical effect can be observed, created with the KINEGRAM REVIEW® technology. KINEGRAM REVIEW® technology, as used in the new Euro series in a stripe application, was specifically invented for window features. Using it in a patch format offers a significantly bigger width

than a stripe – and thus can cover a much larger window, which in turn offers a much larger area for visibility and recognition of the reverse side of the foil. The KINEGRAM REVIEW® optical technology thus lends itself especially for use with the KINEGRAM® APL application technology. Both complement each other for the benefit of quick and easy authentication of a banknote.

In addition to enabling the use of foil patches over banknote windows, KINEGRAM® APL also tears down other mechanical barriers: cutting-edge foil based security features which up to now could not be used on banknotes are now available for central banks and banknote printers. Elements deemed technically impossible can now be put into practice and can be applied onto banknotes. KURZ demonstrates this with a fourth new house note, which carries a patch using KINEGRAM VOLUME® technology with its unrivaled “on-off” effect. This is the first time that a KINEGRAM VOLUME® feature is available for use in patch rather than stripe format.



KINEGRAM® APL is a patented, significant technological advancement in both security feature choice and application. It benefits all stakeholders in the industry: Central Banks have an additional security element to choose from and gain access to previously impossible features. Banknote printers retrieve process control in banknote production, bringing added value and security creation back to the shop floor. Banknote designers profit from entirely new opportunities in design integration and fully exploiting the possibilities offered by patch application. Overall, the banknote supply chain will experience much higher flexibility.

Flexibility is a key factor under many aspects in today's globalized and increasingly digitized world. Our industry

has experienced a growing influence from non-cash payments, and it is clear that consumers around the globe appreciate flexibility in the choice of payment methods. However, cash does remain widely popular, and banknotes will continue to be an essential element in global transactions. In line with this, Level 1 security features will keep playing an indispensable role – and with KINEGRAM® APL perfecting the available selection of application methods, foil will remain to be the essential element. ‹‹

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CRANE CURRENCY

REIMAGING
BANKNOTE SECURITY –
MOTION SURFACE™

Reimaging Banknote Security – MOTION SURFACE™

CRANE CURRENCY

We see our industry poised at the threshold of a new and historic technological milestone. A technological leap that reimagines our relationship with currency. The introduction of a new class of security feature that has the power to reshape the public's relationship with its currency. A security feature that is a dynamic display capable of generating surprise and curiosity. A feature that is obvious and intuitive and as remarkable as the banknote's value.

This feature is MOTION SURFACE™, a new security feature applied in the printing works that provides endless opportunities to engage the public by bringing to life the security and value of a banknote.

MOTION® micro-optics have evolved significantly since its first use in the Swedish 1000 SEK banknote over ten years ago. Like the US\$100 FRN, the new Swedish series utilizes MOTION Switch, a more complex version of MOTION which was also chosen by the Bank of England and most recently the Saudi Arabian Monetary Authority for protecting all of its new high value banknotes.

Crane's RAPID® micro-optic feature has created a new array of secure, visual effects on the back of MOTION's proven security, sparking great interest by central banks. MOTION, MOTION Switch and RAPID are all integrated into the banknote design as a windowed feature. Today, the ability to apply MOTION as a large feature to the surface of the banknote is now possible with MOTION SURFACE.

Crane Currency's micro-optics based security features are now used in over 85 denominations around the world.

THE PUBLIC – FIRST LINE OF DEFENSE

Counterfeiters rely heavily on a public that is not interested in looking at their banknotes. They use distractions such as poor lighting and loud sounds and target busy and inattentive sales people. They understand that the public is sparing in the attention it pays to checking its banknotes. This is our industry challenge – to create banknotes that can be authenticated quickly and definitively, even by an uninterested public.

MOTION SURFACE discourages counterfeiting in two ways. First, it counters distraction by providing the public with an easily verifiable element that is an integral part of the banknote's identity. MOTION SURFACE images are not two-dimensional – they have depth, a past and a personality that can tell a story in a glance. MOTION SURFACE provides designers with an entirely new and flexible collection of visual effects to build an identity aimed at maximum public recognition. Second, the technological foundation provides no easy starting point for the potential counterfeiter. Unlike holograms, the miniature lenses and ultra-micro printing used to produce MOTION SURFACE have no counterparts in other industries.

BRINGING IMAGES TO LIFE

MOTION SURFACE is a new micro-optics feature platform built on the technology behind MOTION®. Crane Currency's micro-optics technology is widely recognized as the state-of-the-art counterfeit deterrent technology for banknotes.

The customizable display area of MOTION SURFACE security features brings images to life, allowing security designers to imaginatively present the banknote's story of value, permanence and trust. With more pixels per area than is used by even the most advanced smartphone, MOTION SURFACE masks the feature's complexity behind stunning three-dimensional effects that can provide quick assurance to everyone that the banknote is authentic and valuable.

The number of MOTION SURFACE effects is substantial and can be combined into an overall message which itself can be seamlessly integrated into the banknote. This new medium of expression allows central banks to communicate important cultural and national stories in a manner once impossible, while resting on the uncompromising security of MOTION micro-optics.



ENGAGING VISUAL EFFECTS

Only a few of the effects that MOTION SURFACE is capable to display have been made known to the industry in the form of the MOTION® and RAPID® products. MOTION SURFACE is thinner than its predecessors and has made it possible to apply it to the surface of the banknote paper during printing. This has paved the way for larger and highly detailed visual effects to be created and combined, rendering striking and beautiful banknotes.

Larger display areas give designers unique options and abilities to integrate the micro-optic security features with the print design – thereby enhancing public engagement and interest.

Highly detailed visual effects stem from the incredibly high resolution of the MOTION SURFACE technology. Designers can capture in exquisite detail true life characteristics of form, shading and texture.

Three-dimensional effects are also possible, giving an impression of floating images that have the power to surprise and delight, and give life to symbols and objects that can appear to come right out of the banknote! These effects on MOTION SURFACE includes Flicker (with a highly-controlled switch between on and off), Shimmer (a controlled shine), Sliding Bands (with high contrast movement along pathways to highlight underlying symbols), Deep (in which objects appear to sit below the surface of the banknote) and Topo (topographic – in which objects appear to rest on the surface of the note).

STATE-OF-THE-ART ENGINEERING AND DESIGN

MOTION SURFACE is a big leap in security technology for the banknote industry. Engaging three dimensional effects open up completely new ways to relay cultural stories and build public trust. The technology and security is here. The rest is up to the imagination of designers, artists and other creators.

Our commitment to MOTION micro-optics is demonstrated by MOTION SURFACE, a technological leap that is built on over ten years of proven effectiveness in stopping counterfeiting. «





MOTION SURFACE FACTS

- Display technology that projects one or more visual security effects
- Super high resolution renders high definition, precise images
- Applied in the printing works via proven Opti-Nota H application equipment*
- Unparalleled ability to integrate and create
- No shiny metalized appearance
- Fluid and dynamic movement effects
- Miniaturized form of MOTION micro-optic technology
- Supports forensic features traceable only by law enforcement or the central bank issuer

* Opti-Nota H is a product of KBA-NotaSys SA

CRANE CURRENCY

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INDUSTRY NEWS

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YOUR BENEFITS

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- › Summarized news, quick reading
- › Easy handling
- › Early access to pictures of banknotes



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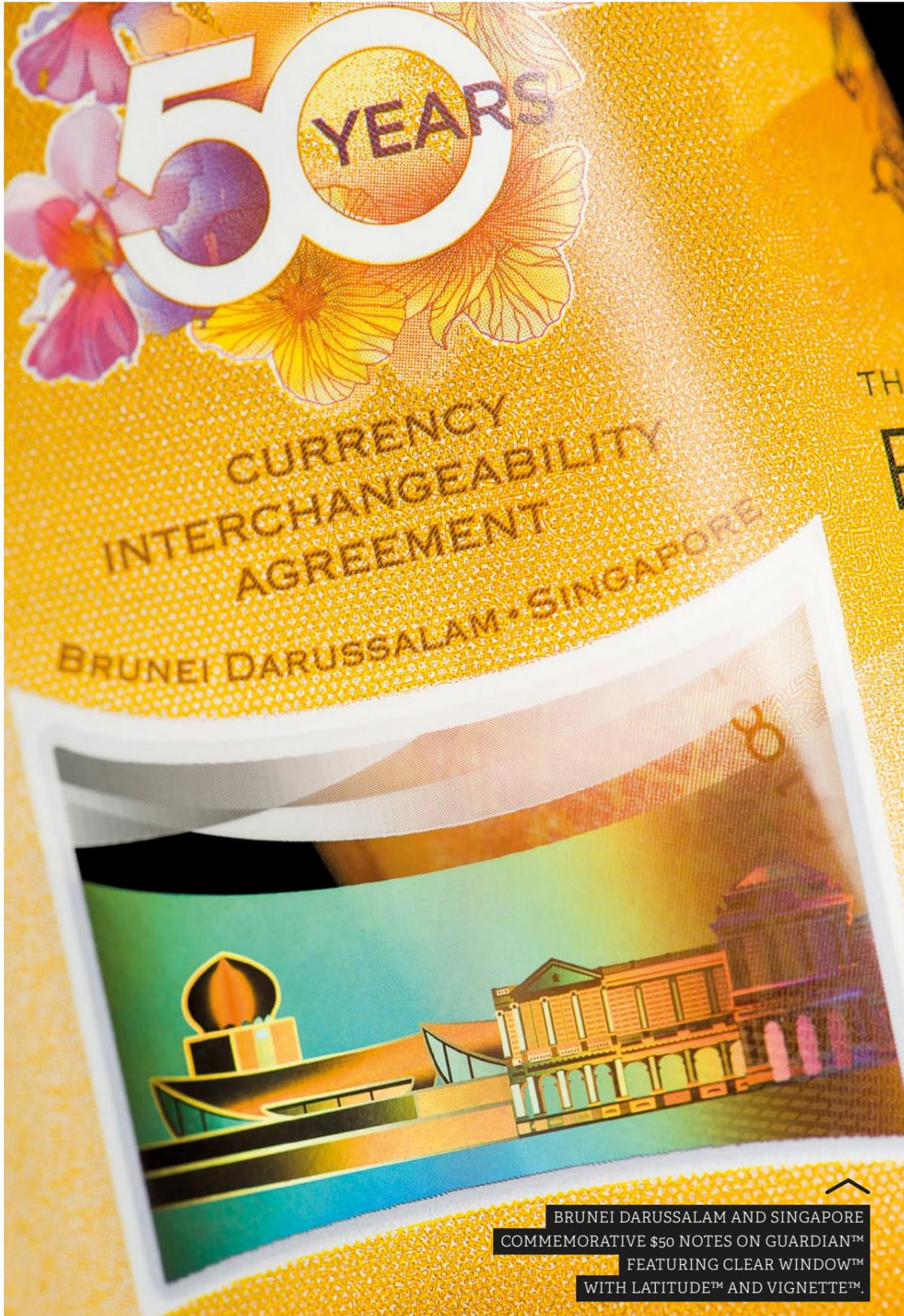
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BRUNEI DARUSSALAM AND SINGAPORE
 COMMEMORATIVE \$50 NOTES ON GUARDIAN™
 FEATURING CLEAR WINDOW™
 WITH LATITUDE™ AND VIGNETTE™.

CCL SECURE

GUARDIAN™
 POLYMER SUBSTRATE:
 THE FUTURE OF
 BANKNOTE SECURITY

NEW MAURITANIA SERIES ON GUARDIAN™
FEATURING CLEAR WINDOW™ AND HALF WINDOW™
WITH VIGNETTE™, AURORA™ AND METALIX™

Guardian™ polymer substrate: the future of banknote security

CCL SECURE

As the adoption of polymer substrate grows worldwide, Guardian™ polymer banknotes have the technical capacity to continue redefining what a 'new paradigm in banknote security' means to the industry.

CCL Secure was born out of a central bank's vision to 'build a better banknote' – cleaner, safer and stronger – and this goal has underpinned Guardian™ polymer substrate technology ever since. Following several years of extensive research and development, Australia began the transition to Guardian™ polymer in 1988 with the release of the \$10 bicentennial commemorative banknote. Polymer and the clear window had begun its journey into history.

In the last three decades, the innovative Guardian™ banknote substrate has been used to issue in excess of 55 billion banknotes, gaining the confidence of more than 40 central banks for use in over 160 mainstream and commemorative notes circulating in some of the most demanding cash cycles.

Today, CCL's polymer technology continues to evolve at an incredible rate and the development of our latest security features and designs are key drivers in this change. The security features and composition of the many layers that form a polymer substrate inspire designers to focus their activity in the synchronisation of polymer and the associated security features. However, all the complex elements that, ultimately, represent and protect the identity of a nation must be adapted to the printing systems – it is not about designing a complex banknote that is difficult to produce, but one that is difficult to counterfeit.

A WINDOW INTO THE FUTURE OF BANKNOTE SECURITY

Paper substrates have existed for centuries and evolved, not in the raw materials they use, but in the development of watermarks, security threads and durability. Today, there are more modern substrates such as polymer being adopted, which has created a more dynamic and complex three-dimensional platform, allowing banknote designers to exploit combinations of transparency and opacity as well as the integration of security features and banknote printing.

When the first polymer banknote was launched in Australia in 1988, the presence of a clear window alone represented a new paradigm in security. It was a revolutionary new base material – combined with some unique security features – that instantly eliminated the casual and semi-professional counterfeiter from being able to reproduce the notes, as the film effectively combatted photocopying.

The clear polymer window has been so successful in deterring counterfeits; it has inspired the creation of window features on a number of paper substrates. Today, the window remains a key security feature on polymer banknotes, as it is easily recognisable by the public and highly secure.

Polymer substrate has now 30 years' proven market performance and Guardian™ has been at the forefront of polymer development throughout this period. The unique bi-axially oriented polypropylene (BOPP) Clarity™C gives Guardian™ its distinctive balanced tensile properties, which are not only exclusive to the polymer banknote market, they also provide superior printing and handling properties across all banknote printing platforms.

Clarity™C film in combination with CCL Secure's opacification process, which includes printing and embedding security features on the film, creates Guardian™ substrate.



CANADA 150 COMMEMORATIVE BANKNOTE ON GUARDIAN™ FEATURING METALIX™ AND A COMPLEX WINDOW™ WITH SPOT COLOUR™ AND FOIL. THIS IMAGE IS A COPY THAT IS REPRODUCED WITH THE PERMISSION OF THE BANK OF CANADA

GUARDIAN™ SUBSTRATE IN COMBINATION WITH SECURITY FEATURES

The Guardian™ platform allows CCL Secure to include not only a wide range of proprietary features, but also third-party features such as optical effect inks (OVIs) and optical variable devices (OVDs) applied in windows, which can be integrated within our Clarity™C base film or applied directly onto Guardian™ substrate.

The multiple opacification layers that make up Guardian™ allow CCL Secure's proprietary features to be applied at various stages of manufacture, within a clear window, under one or multiple layers of opacification, on top of opacification or a combination of all three, increasing feature integration, complexity and security.

Examples of features which can all be applied in a clear window allowing them to be viewed from both sides of the substrate are:

- CAMEO™: a rich tonal image printed within the transparent window.
- LATITUDE™: an optically variable device providing colour shifts and movement within the image when tilted, with the added security of being see-through in transmission.
- ECLIPSE™: an optically variable device which reveals a hidden message when looking through the transparent window at a point light source.
- AURORA™: a combination of two optically variable inks which match in reflection but are different in transmission.

Other features such as Shadow Image™, Shadow Image Thread™, Micro Lettered Thread™ and MAGread™ can be applied under one or multiple levels of opacification, allowing designers to hide them beneath banknote printed features, or create tonal effects with different layers.

METALIX™, IRIsWitch™ and Spot Colour™ are printed on the surface opacification layers for a more overt effect. Opacification layers also allow features such as AURORA™ and GSwitch™ to be printed in a Half Window™, creating a switching effect on the window side and a tinted substrate on the reverse.

The combination of layers means design possibilities for Guardian™ are limitless, and a banknote designer can allow their imagination to transcend multiple layers, rather than having the single dimension restrictions of a paper substrate.

AUSTRALIA NEW GENERATION \$10 BANKNOTE ON GUARDIAN™ FEATURING A POSITIVE SHADOW™ AND A TOP-TO-BOTTOM COMPLEX WINDOW™ WITH VIGNETTE™, SPOT COLOUR™ AND FOIL



WHAT ARE THE DRIVERS TO SWITCH FROM PAPER TO GUARDIAN™ POLYMER

CCL Secure is the global expert in polymer banknote substrate with its fully integrated, high-security Guardian™ product, but security is just one of the many benefits of Guardian™.

There are a number of drivers behind a central bank decision to switch a single denomination or a full series to Guardian™; these include:

Security – with the use of the highly-secure proprietary Clarity™C film, combined with clear windows and the integration of Guardian™ features, have all demonstrated year on year that counterfeit rates drop at least 10 times when Guardian™ replaces an existing paper banknote.

Cost Savings – Guardian™ adopters come to appreciate over time that cost savings come in several forms. The main aspect being lifespan of the banknote, which typically ranges from 3-5 times that of paper banknotes. Lifespan also has a knock on effect into cash cycle savings, with a reduction in the movement of banknotes, sorting and handling playing a significant cost saving role.

Environmental – As more and more central banks conduct research in this area, they start to appreciate the benefits of a 100% recyclable Guardian™ product. By adopting Guardian™, they are not only reducing the impact on the local environment compared to paper substrates but are also

saving costs by selling on recycled polymer rather than sending to landfill.

Cleanliness – Independent Central Bank studies have also shown Guardian™ contains significantly less bacteria than paper banknotes and can help reduce the spread of disease.

Customer perception – Changing to a full series adds consistency and reduces confusion for the general public, especially in the areas of touch and feel. The suite of Guardian™ features allows for a coherent theme throughout a series allowing identification to be made much faster. Guardian™ features can also be designed around a flat structure, covering the whole series, or tiered for lower and higher denominations.

Cash handling – A full Guardian™ series creates less complexity at cash processing machines, and gives central banks better purchasing power.

From a technology point of view, while paper remains a flat two dimensional structure, polymer substrate is a three dimensional space. As CCL Secure's R&D scientists work from the micro to the nano-level, this space in relative terms is getting larger and larger. Supported by CCL Secure's outstanding R&D program, the spatial characteristics are key reasons why Guardian™ will continue to stay ahead of counterfeit technology far into the future.



CCL SECURE

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THE NEW £10 NOTE ON GUARDIAN™ FEATURING A COMPLEX WINDOW™ AND HALF WINDOW™ COMBINATION WITH CAMEO™, VIGNETTE™, GSWITCH™ INK (VIOLET TO GOLD) AND FOIL.






 KOMORI

BANKNOTEOLGY
 RELEASING
 NEW POTENTIAL
 INTO THE BANKNOTE
 MANUFACTURING
 INDUSTRY



Banknoteology

Banknoteology is the science Komori applies to the study, research and development of its banknote manufacturing processes. The discipline encompasses all the major processes currently employed across the global banknote printing industry and the systems it generates empower banknote printers with the potential to elevate their production capabilities to a new and inspirational level.

in tune with
eenvironmental
 responsibility

Banknoteology

The Banknoteology principle began in 2016 when Komori launched CurrencyOnDemand – its exclusive methodology targeted at re-inventing banknote manufacturing processes. CurrencyOnDemand has two main pillars, one is to maximize uptime and the other is to strengthen design capability.

It has always been Komori philosophy to provide equipment and systems in accordance with customer demand. Indeed, very many of Komori's concepts and developments originate from customers' ideas and feedback and this helps to ensure that the company's efforts always continue to focus on delivering Kando – which is defined as "Beyond Expectations".

In this Banknote Technology Report, we introduce Komori's latest banknote offset printing innovations which unlock brilliant new techniques and potential opportunities into the industry.

MAXIMIZING UPTIME

FAST SPEED

To respond successfully to today's increasingly demanding production targets and deadlines, consistently high speed printing is critical. Komori's sophisticated sheet transfer and ink distribution systems have been designed to ensure that the highest possible printing speeds can be maintained when using virtually all substrates and the latest Komori offset banknote printing equipment has the capability to run at 12,000 sheets an hour.



KHS-AI ADVANCED INTERFACE

KHS-AI is an integrated fast makeready system which dramatically reduces job changeover times and materials waste. Its intellectual learning function optimizes colour matching by continually analyzing inking data and enabling fast, precise presetting according to changes in the image, environment and the materials in use.



In addition to ensuring high-precision start up, KHS-AI also facilitates very stable sheet feeding and delivery through its air and register pre-setting of sheet sizes and denominations. The system not only provides management of job control, operating records, status history and maintenance data but is also equipped with a self-diagnostic function to help alleviate problems.

PDC-SX DENSITY CONTROL

PDC-SX, Komori's spectral print density control system, digitizes the colours on printed sheets – which previously would have required visual judgement and adjustment by the operator.

This system adds automatic colour-to-colour registration to the control function so that both colour and registration are measured in one process and any adjustment data is automatically fed back to the press.

PQA QUALITY INSPECTION AND CONTROL

PQA is Komori's in-house inline automatic quality inspection system which inspects all sheets during each banknote manufacturing process. Komori's automatic inline quality inspection philosophy is to optimize banknote production by taking corrective actions and automatically removing defective sheets by identifying any discrepancies immediately as part of Komori's lean zone control.

This self-assurance procedure is also applied to the Komori manufacturing control system in Tsukuba, Japan. Komori provides a range of PQA series systems suitable for the various Komori banknote press products.

STRENGTHENING DESIGN CAPABILITY

Multicolour

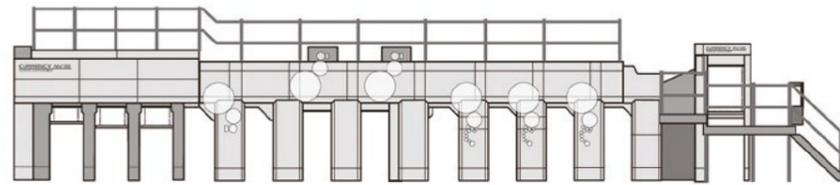
Komori provides a flexible offset press design with a choice of 4/4, 5/5 and 6/6 configurations, such as the Currency LC1232 multicolour press, to enable the incorporation of higher level security designs and features. Alcohol free wet printing is available on all units to improve print quality, assist in improving the working environment and to ensure total compliance with all health and safety regulations.

It is recognized that the increasing complexity of banknote designs sometimes brings with it the possibility of ink contamination. Komori offset presses alleviate the risk of spoiling work and the consequent wasted downtime needed to correct such issues by enabling the different inks to be run on separate printing units.

Multiprocess

In 1967, Komori developed and installed its combination multiprocess offset & intaglio press to print Japanese Yen. Since then, through Komori's unique MED (Modular Equipment Design) concept, the company has introduced further advancements to provide two or more processes in one single pass, for example, offset & intaglio and offset & screen.

The Combination Multiprocess Press provides banknote designers and printers with the facility to create innovative, original banknote designs because the multiple processes can be printed in the same pass through the machine. This gives an exceptionally tight level of registration that cannot be achieved by printing in two separate processes.



Combination Multiprocess Numbering & Varnishing Press

Finelines

Only Komori can offer customers the choice of both blanket to blanket cylinder configuration and blanket to solid cylinder configuration for the banknote offset printing process. We respect the customer's decision to select whichever process is most suitable for any particular application and production line.

However, it is a recognized fact in the industry that the blanket to blanket configuration intrinsically imposes limits of sharpness of the offset print, whereas the blanket to solid cylinder configuration

increases fine line sharpness and accuracy.

Komori can confirm that super fine lines are achievable without issue by utilizing a 12,000 dpi wet offset plate on the blanket to solid cylinder configuration.

Komori is continually reinventing the banknote manufacturing process with constant progressive solutions to provide innovative new banknote printing equipment and systems in response to the ever-varying demands of customers and markets throughout the industry.



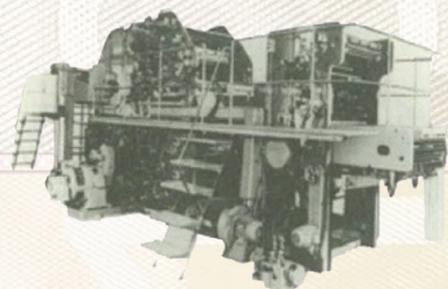
感動
Kando
Beyond Expectations

KOMORI

95th Anniversary

1923: KOMORI MACHINERY ESTABLISHED IN TOKYO

95 years later, Komori Corporation now designs and manufactures sheet-fed/web-fed offset, banknote/security, digital and printed electronics printing machines for over 60 countries worldwide, along with an ever-growing range of associated products.



1958:

Komori's first dry offset banknote press

The press was developed for and delivered to the National Printing Bureau Japan, which is responsible for all Japanese banknotes in circulation.

1967:

Komori establishes its own drive gear manufacturing factory

To ensure the highest quality, supremely durable gears needed to deliver precision print on Komori's increasingly wide product range now supplied to expanding world markets.



1997:

The advent of double deck currency offset technology

Introducing a completely new concept for the banknote and currency industry and creating increased security opportunities.

2002:

Operations commence at Komori's new Tsukuba Plant

A totally new, groundbreaking and environmentally conscious factory, built on a dedicated high technology park near Tokyo.



2009:

Tsukuba plant doubles in capacity

Running predominantly on self-generated solar power and incorporating revolutionary recycling facilities, the plant has been achieving zero emissions since 2004. It contains the world's most advanced production and research facilities and the Kaizen continuous improvement philosophy is practiced throughout every division.



2009:

Komori Graphic Technology Center unveiled in Tsukuba

Developed to provide the most comprehensive demonstration, training, educational and development facilities for the entire printing industry worldwide.

2016:

Komori launches Currency OnDemand during the Currency Solutions event at Tsukuba, where the Currency NV32 Combination Multiprocess Numbering and Varnishing Press made its world debut.

At demonstrations in front of the audience from State Printing Works and Commercial Print Works, the NV32 produced non-stop at 12,000 sheets an hour.



2017:

Bank of England installs two new Komori Banknote Production lines, each consisting of the LC1232 12-unit Double Deck Offset Press, IC532III Intaglio Press, RN332III numbering press and GL40CC varnishing perfecting press.

KOMORI CORPORATION

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ARJOWIGGINS SECURITY

GUIDELINES FOR NEW SERIES

Upgrade or new series. Guidelines for selection of optimum paper and embedded security features.

ARJOWIGGINS SECURITY

In a period of increased competition between different payment methods, cash must maintain its level of trust among users, both the general public and professional cash handlers, more than ever before. Banknotes in circulation have to remain in good condition as long as possible, in order to look attractive and be easily authenticated. Therefore the durability of the paper and the resilience of the security features to counterfeiting are key.

When Central Banks consider an upgrade or a new series, they put in place a collaborative and iterative process for the development of the new banknote.

In this article we will highlight some of the critical steps of the development process, in particular the selection of paper and embedded security features and how Arjowiggins Security as a banknote paper manufacturing company contributes its expertise to help central banks add value to their new series.

STEP 1. BUILDING EXPERTISE ON AVAILABLE STATE OF THE ART SECURITY FEATURES AND SUBSTRATE SOLUTIONS

Which substrates are available? What are the differences in terms of cost, technical advantages, durability? Which security features of a current series should be maintained, upgraded? What are the latest innovations? Are they adapted to the specific needs of your country? These are some of the questions to be asked when starting a new series project.

In this critical step, interaction with the paper and security features providers is very important to explore the different options and start building the functional and creative layout. As a pure player, Arjowiggins Security specializes in manufacturing high quality paper and can help the central bank define the technical options for the paper (paper specifications with international standard measurement methods) and its embedded security features (threads, watermarks, fibres, L3 taggants).



STEP 2. CHOOSING THE BEST BENEFIT-COST RATIO FOR THE SUBSTRATE

As many substrates are available, how can one choose the most suitable? Users habits in the country, structure of the series (low, medium and high denominations), available budget, cost/benefit analysis are key factors to be taken into account.

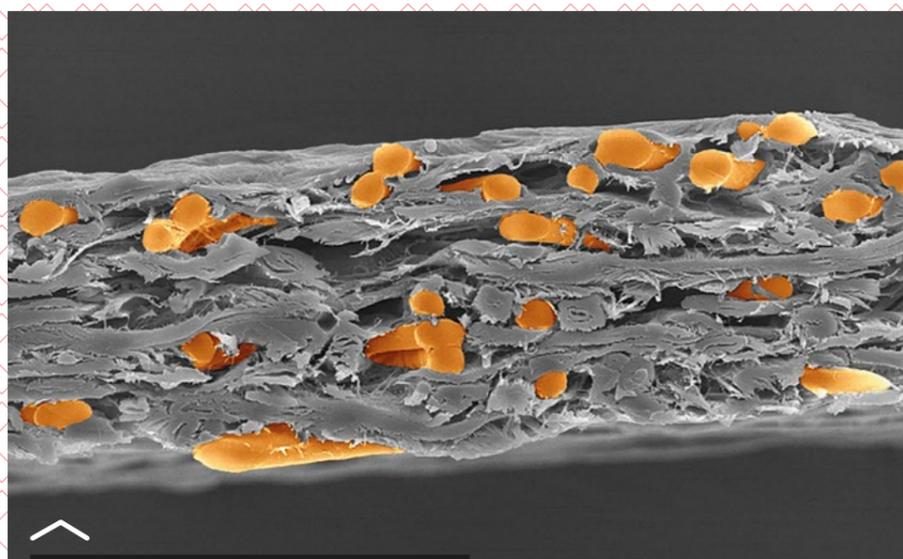
Arjowiggins Security is specialized in cotton paper which is the preferred substrate and used in more than 95% of banknotes worldwide.

After years of investigation, advanced technology has been used to improve the performance of the paper in terms of soiling, tearing, folding, ink abrasion. For instance, for low and medium denominations, high durability papers, with anti-soiling treatment, reinforced with synthetic fibres, can be used with an

excellent benefit-cost ratio. The synthetic fibres are linked with the cotton fibres to create a strong paper base.

Durability can be improved up to two times with Diamone™ Composite reinforced substrate. Even for countries that post-varnish their notes these advances in durability are strengthened, compared with varnishing a standard paper.

Choosing paper rather than polymer allows the possibility to insert a thread into the substrate. Nowadays, with the right know-how, large threads (up to 6mm) can be embedded into the paper. It is now possible in standard and high durability fibre-reinforced papers to include a very large thread and Arjowiggins Security's long experience of embedding threads from all major manufacturers makes it a recognised expert and a trusted guide to build the appropriate paper specifications.



DIAMONE™ COMPOSITE COTTON PAPER REINFORCED WITH SYNTHETIC FIBRES

STEP 3. SELECTING THE BEST-IN-CLASS WATERMARK

The watermark is a key security feature which is created in the core of the paper during its formation. Recommended by Interpol, it remains one of the two most familiar security features for the general public.

In recent years watermarks have benefited from technology improvements. If most countries use a traditional multitone watermark with the addition of an electrotpe generally showing the denomination, some have moved to two **major innovations: the high definition watermark (Vision™) and the Pixel watermark™ (awarded best security feature in 2010 by the International Association of Currency Affairs and used in more than 30 billion notes).** Both watermarks are a step forward in combining graphic appeal and counterfeiting resilience. Thanks to improved resolution, more details, more contrast, Vision™ watermark adds more security, definition, beauty.

Arjowiggins Security recognises that innovation in the field of watermarks will make a big difference to optimising the design of the watermark. Various new series with Vision™ high definition watermark will be issued in 2018 opening a new era for this security feature promoted by paper manufacturers.



CLASSIC WATERMARK (ON THE LEFT) AND HIGH DEFINITION WATERMARK VISION™ (ON THE RIGHT)



PIXEL WATERMARK™

STEP 4. EMBEDDING THE MOST ROBUST SECURITY THREAD

Security thread technology has drastically evolved. From narrow fully embedded threads to wide 6mm windowed threads, a full range of products is available from major thread manufacturers. Technologies are diverse and offer many effects, intuitive and easy to authenticate (colour change, picture, movement). This evolution has made the thread wider and thicker and most new series include wide threads combined with long windows to maximise the visibility and easiness of authentication. The window is the area of the paper that reveals the thread at the paper surface and its dimensions can be precisely defined to optimise technical or design options.

Arjowiggins Security has the know-how to handle the most complex threads with a wide variety of window shapes. The thread is embedded at the very beginning of the formation of the sheet of paper. A large thread combined with a long window increases the complexity of the paper but allows very interesting and novel constructions.

As an example, **Picture thread™** is the first security thread with images having a 3D-effect. The feature is made up of a very fine array of dots or lines that give the image tonal variation analogous to half tone illustrations. Detailed images such as portraits, animals, etc. can be reproduced opening up design possibilities. **Picture thread™ technology can be applied with multiple visual effects such as metallic, holographic, colour change.** Another advantage is the repetition on the banknote of a similar image on the thread, the watermark and the intaglio, making authentication easier. Picture thread™ has been adopted by countries that appreciate its design friendliness and robustness. **More than 3 billion notes have been produced with Picture thread™.**



STEP 5. TESTING THE SELECTED OPTIONS IN REAL PAPER

Once the specifications of the paper and its embedded security features have been defined, it is key to start working on real designs and verifying the robustness of the process with real paper. Arjowiggins Security is a partner of choice for this step of upscaling and fine tuning of the options. ‹‹



ARJOWIGGINS SECURITY

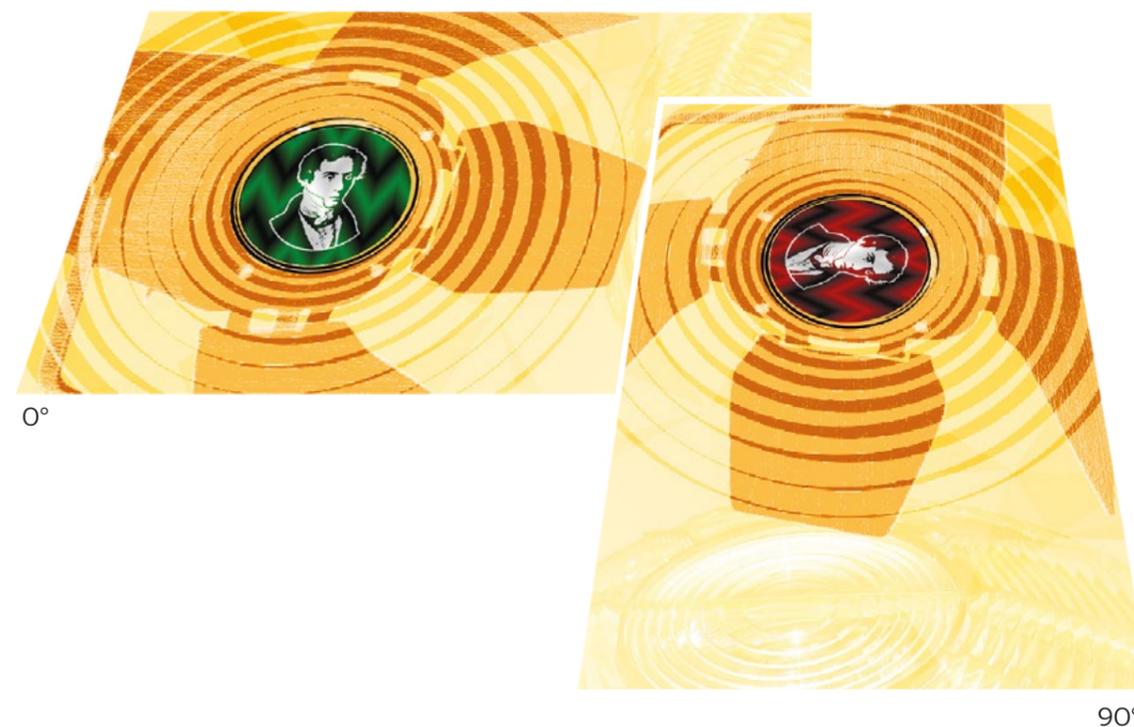
Mr. Fernand Garcia de Cruz
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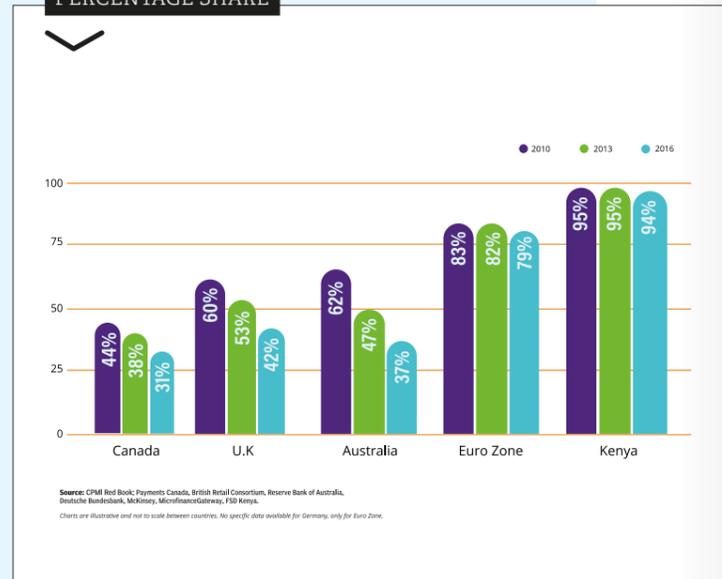
THE FUTURE OF CASH

The so-called “War on Cash” has been fought now for many years, with many predictions of cash being replaced by cards or mobile payments – yet cash is still alive and kicking. Central banks around the world report an increase of cash in circulation year on year, both in volume and value, even in mature and technologically advanced markets such as the UK and the US, as well as cash intensive countries such as Germany and Japan. But one needs to take a closer look at the cash industry for the full story.

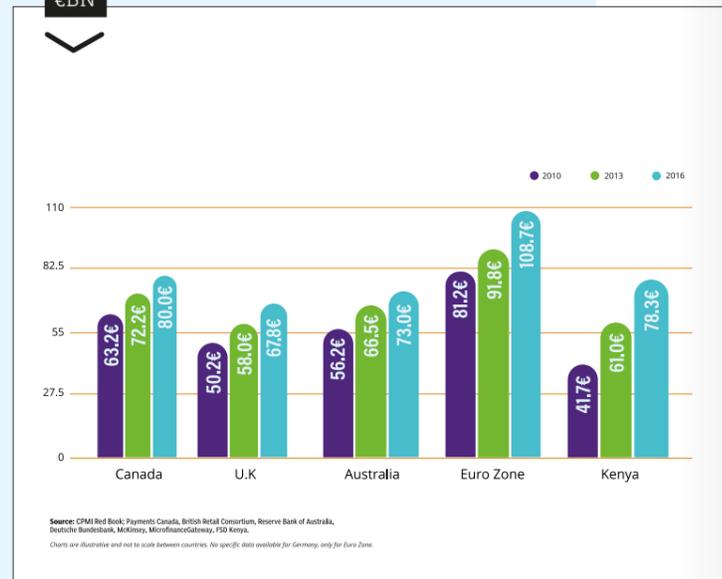
The metric of “cash in circulation” does not necessarily reflect consumer choice when making payments at the point of sale. There are a number of reasons why cash in circulation can increase while cash payments for goods and services can decrease, as we are indeed observing in many countries. These reasons include:

- Technological advancements in the banknote production process – and adoption of advancements such as polymer substrates, varnishing, and more by central banks when issuing new notes – have significantly extended the lifespan of banknotes. The volume of notes in circulation has increased with longer circulation rates.
- Increasing efficiencies in the banknote recirculation process, such as the usage of highly calibrated fitness sorters in commercial centers, have led to a decrease in “unfit” banknotes being repatriated to the central bank for destruction.

VOLUME OF CASH TRANSACTIONS, PERCENTAGE SHARE



VALUE OF CURRENCY IN CIRCULATION, €BN

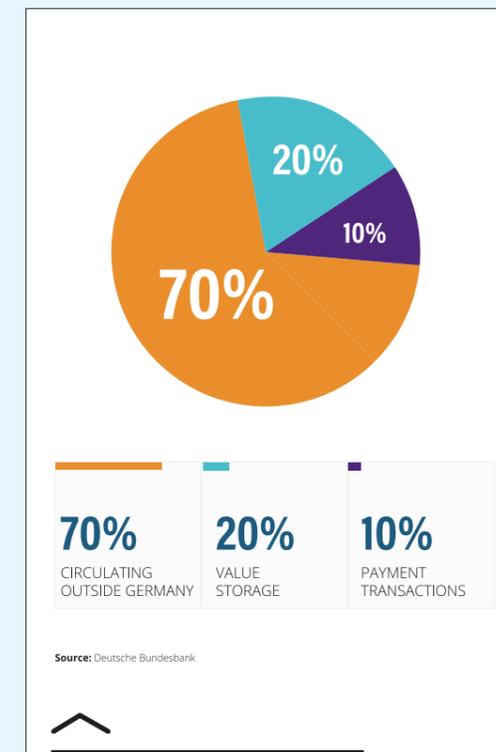


Additional insights, presented by:



While little empirical data is available to establish the percentage of notes in circulation held for value storage either incountry or abroad, some statistics offer interesting insight.

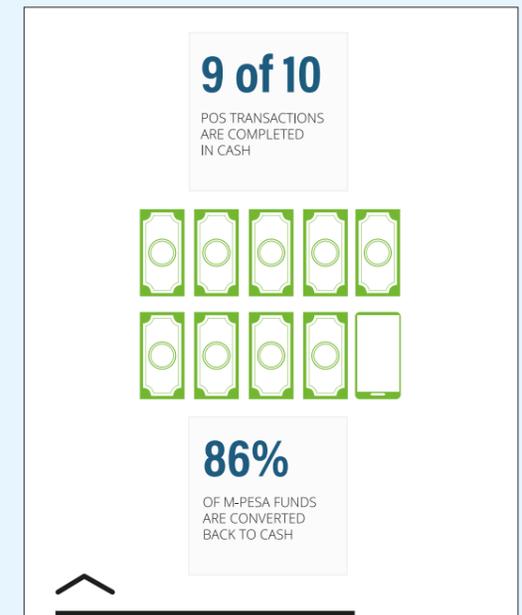
- Deutsche Bundesbank estimated in February 2018 that only 10% of Euro banknotes issued in Germany are being used for payment transactions; 20% are expected to be held as value storage in country, and 70% of banknotes issued by Deutsche Bundesbank are believed to be circulating outside of Germany.



GERMAN CASH & PAYMENTS

- Similar estimates are made for US-dollar banknotes, with more than 2/3 of the \$1,463 billion banknotes, of which \$1,154 billion are in USD 100 notes, being held outside of the US.

- Kenya provides a great example of cash resilience in the payment space. When Kenya implemented the simple but effective mobile payment platform M-Pesa in 2007, many expected a rapid decline in cash usage – which was not the case. Nine out of 10 POS transactions in Kenya are still completed in cash, and 86 percent of the funds entering the M-Pesa platform are converted back to physical currency.



KENYA & CASH RESILIENCE

Clearly, cash remains a valuable and trusted payment instrument across the globe, and banknotes are here to stay. Changes in consumer behaviour and cash usage, however, have challenged traditional approaches across the cash cycle, and many of the old rules no longer apply. The industry now has the opportunity to adapt to a “new normal” in the payments landscape, enabled by the innovative technologies incorporated into today’s modern notes.

Additional insights, presented by:



The key cash cycle trends detailed below highlight how today's technological advances will maintain the relevance and utility of banknotes now and into the future.

Cash Back at Point of Sale – Increasingly, retailers now activate their point of sale devices with cashback processing capabilities, enabling consumers to use it for cash withdrawals with card transactions. As a result, the retailer reduces in-branch cash holdings and time required to balance the day's cash transactions, as well as the frequency of repatriating surplus cash to the bank.

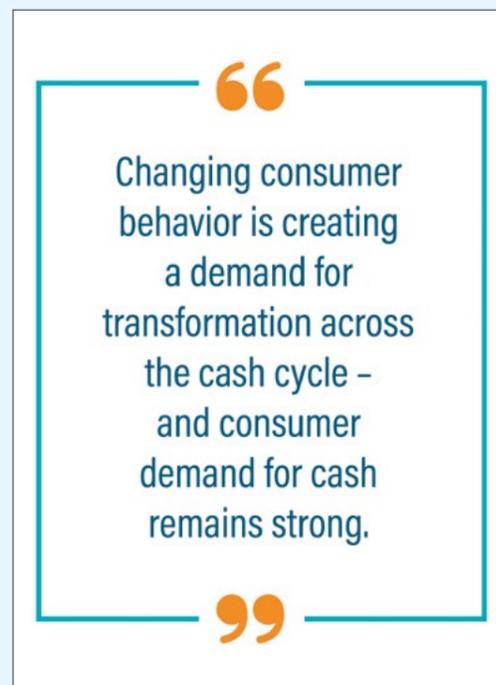
Use of Cash Recyclers – Banks increasingly deploy cash recyclers that process both deposits and withdrawals in a single self-service machine, thereby removing costly steps historically outsourced to Cash In Transit (CIT) companies (with the exception of the occasional replenishment or repatriation of surplus cash).

Changing Role of the Central Bank – The central bank's role within the cash cycle has also changed. Central banks have implemented banknote recirculation frameworks that regulate the commercial cash industry and ensure the quality of banknotes in circulation through spot checks and frequent audits. These arrangements often include "Notes Held To Order" schemes, where commercial cash processors hold inventory on behalf of the central bank and only settle for banknote usage as they withdraw from the stock. In line with such changes, the number of central bank branches has declined.

These industry-wide trends and data show that changing consumer behavior

is creating a demand for transformation across the cash cycle – and that consumer demand for cash remains strong. Specialists such as Currency Research are in high demand to help define and formulate these transformation strategies.

Contextualizing the trends and providing an understanding of global developments against a local environment is key to avoiding costly mistakes, and for making wise investments and strategy decisions in the transformation process. ‹‹



CURRENCY RESEARCH is an international organization that believes education and communication are fundamental to growth and innovation within central banks, their suppliers, and the related supply chain for currency and payment systems. Visit www.currencyresearch.com to learn more.

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THE CASH CYCLE IS EVOLVING

Whatever the future of cash may be – and to be clear, CR believes cash is here to stay – the fact remains that once cash is released to the public, the industry must do its best to ensure cost-effective and efficient systems to ensure the relevance of cash in the payments landscape.

To support the cash handling industry, CR launched the **Cash Cycle Seminars** (formerly named ICCOS) in 1995 to bring together all of the regional stakeholders in cash circulation to share perspectives, ideas, cost-saving technologies, strategies, best practices and case studies. Through the years, the localized focus of the Cash Cycle Seminars (Europe, Asia, Americas, and MEA) has allowed convenient access for delegates to join these meaningful conversations and connect with representatives from central banks commercial banks, cash management companies/CITs, and the related supply chain.

Staying informed about the changes in consumer behavior, and the industry's efforts to respond to those changes to support the cash handling community, is why events like CR's Cash Cycle Seminars are so important. By helping institutions adapt to new processes, workflows, and technologies in the continued effort to streamline cash handling, we come together in the effort to keep the cost of cash down to maintain cash as a payment choice that is inclusive for all.

Come to a Cash Cycle Seminar to engage in the conversation, share your experiences, and learn from others. Upcoming events will be held in:

Asia | Yogyakarta, Indonesia | September 3–6, 2018

Americas | Los Angeles, USA | November 12–15, 2018

MEA | Accra, Ghana | February 11–14, 2019

Europe | Tbilisi, Georgia | May 2019

Learn more about the Cash Cycle Seminars at www.iccos.com.



Additional insights, presented by:



DO AMERICANS USE SECURITY FEATURES?

What's the most used security feature on US currency? Who uses it? Is it effective? Answers to these questions should drive the development and selection of features.

Until now the answers to these questions were based on anecdotal discussions and personal experiences. To help the industry target future work effort based on quantifiable information, **Currency Research (CR) conducted a study of 1232 respondents** that is representative of the US population in terms of geography, age, gender, race, income, and education. Results reported are significant at the 95 percent significance level (1). The results of the study reinforce some long-held beliefs, but also lead to some surprising insights.

CURRENCY RESEARCH
CONDUCTED A STUDY OF
1232
RESPONDENTS

US currency has four primary public features: the **watermark** (\$5 through \$100 notes), **color shifting ink** (\$10 through \$100 notes), the **security thread** (\$5 through \$100 notes), and the **3D security ribbon** (\$100 notes only).

While not a feature per se, the feel of the notes printed with **intaglio** pressed on a unique **cotton-linen fiber paper** gives the notes a telltale tactility that can be considered an inherent security aspect of US currency. We surveyed Americans on the features they use to authenticate notes of various denominations (including some features that are not used on US currency or on all denominations).

US CURRENCY HAS FOUR PRIMARY PUBLIC FEATURES



The **watermark** is the most used feature for all denominations and increases in use as the denomination gets higher. At first this sounds like a victory for the tried and true watermark, and it is to a degree. However, only 3 in 10 Americans use the watermark on the most checked denomination, the \$100, and the number drops to 2 in 10 for the \$20 note. More concerning, however, is that 1 in 10 Americans report that they use the watermark to check for authenticity of the \$1 note. However, the \$1 bill does not have a watermark. Interestingly, approximately the same number of Americans report using holograms to verify these denominations; these, too, do not exist. So, while the watermark is the most used feature, the results indicate just as many Americans use a nonexistent feature, calling into question the knowledge of the American public on this topic in general.

Additional insights, presented by:



The **security thread** is the next most popular feature by which 2 in 10 Americans authenticate \$20 through \$100 notes. Again, however, 1 in 10 Americans also report using this feature to check the authenticity of \$1 notes, which do not include security threads. The **3D security ribbon** on the \$100 note is also used by 2 in 10 Americans, but once again 1 in 10 report using the absent feature to check authenticity of \$20 and \$1 notes. **Color shifting ink** comes in last for all denominations, with only 1 in 10 Americans looking for it. About 2 in 10 Americans report using the feel of the note to tell it is real.

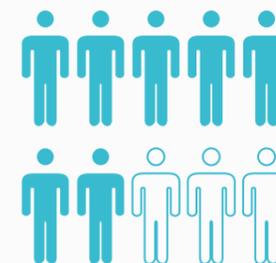
The Foundation of Confidence

What does all this mean? Are features too confusing, or do Americans just not care? What's the point of spending vast amounts of money on feature development and public education if the public reports using fake features just as often as real features? With nearly 5 in 10 Americans reporting they don't check for authenticity, why bother?

The short answer is because the other half do check.

CONFIDENCE IN THE CURRENCY

People generally have their preferred method of checking their notes. Some use the watermark, some use the thread, and some use color shifting ink. For those that don't check, nearly **7 in 10 report** that it is because they either **have trust in the currency** or that they just do not think of it.



People generally have their preferred method of checking their notes. Some use the watermark, some use the thread, and some use color shifting ink. For those that don't check, nearly 7 in 10 report that it is because they either **have trust in the currency** or that they just do not think of it. Only about 3 in 10 report that they don't know how to or do not care.

This finding is great news for the long-term effectiveness of the security feature and public education programs. The majority of the public has confidence in the notes because of the long-standing security of the notes. In short, they don't have to care or pay that much attention. **The public's indifference, or lack of knowledge in some cases, can be viewed as a byproduct of the overall success of the suite of features used to protect the public, and of public education and law enforcement efforts.**

CR also studied which demographic of the population was most likely to check for authenticity and use cash. The result was that young, less affluent, single, minority women are more likely to use and check notes for authenticity than their older, more affluent, married, white, and male counterparts. This type of demographic analysis can also help inform future development and public education efforts.

For more detailed results and insights about currency use trends and security feature effectiveness please contact Shaun Ferrari at CR, sferrari@currency-research.com. CR will also be presenting more of these findings and hosting a panel to discuss the effectiveness of security features at the Banknote Conference from May 21-24, 2018 in Dallas. For more information visit www.banknoteconference.com. <<



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