

Going Beyond



DeLaRue

June/July 2021



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Introduction

The past two months have seen more banknotes issued that have been manufactured by De La Rue. The Bank of England £50, Bank of Scotland £50 and the De La Rue designed 10 and 100 Peruvian Soles all entering circulation.

We were extremely honoured to have been listed for the International Association of Currency Affairs Excellence in their annual Currency Awards in recognition of our global response to the pandemic. We are very proud of the efforts and results of everyone who contributed to our being recognised.

De La Rue was proud to receive recognition as a [European climate leader](#) from the FT and Statista recently. De La Rue is ranked in the top 25 of 300 European climate leading businesses. We have been quantifying, reporting and reducing our environmental impact for over a decade and it is great to see the continuous efforts across our sites being recognised. Thank-you to everybody involved.



In this edition of Going Beyond we focus more on the critical role that banknote design can play and the recent progression of our design thinking to optimise our processes for sustainability. Page 9 talks about the value of design and covers some of the highlights of a presentation recently given at the International Banknote Designer's Presentation.

We will be discussing our approach to central bank digital currencies (CBDC) in our next webinar. As ever, these webinars are focussed on topics of interest to you and aim to be engaging and interesting. More details to follow on our Events page.

If you would like any more information about anything in this newsletter or you would like to register for future webinars please contact us at currency@delarue.com.

A handwritten signature in black ink, appearing to read 'Ruth Euling'.

Ruth Euling, Executive Director and Managing Director, Currency





“This new £50 note completes our set of polymer banknotes. These are much harder to counterfeit, and with its security features the new £50 is part of our most secure series of banknotes yet.”

Sarah John, Chief Cashier, Bank of England

Polymer conversion completed

The Bank of England's new £50 entered circulation on the 23rd June 2021, completing a six year journey to convert all Sterling denominations to polymer substrate.

The new £50 features the scientist Alan Turing, who was best known for his code-breaking work at Bletchley Park which helped end the Second World War. The launch date coincides with his birthday. The polymer note joins the Churchill £5, the Austen £10 and the Turner £20 meaning all Bank of England banknotes are now available on polymer.

Design & Print

The aesthetic design of the new £50 was created by the Bank, before being passed over to De La Rue complete the process of converting this design into a functional, printable banknote. De La Rue is the sole printer for the Bank of England and from July 2021 will be the majority polymer substrate provider for the £5, £10 and £50 denominations. Every Bank of England denomination is now printed on SAFEGUARD® polymer.

By integrating all the elements of the banknote into the design, it amplifies the theme of the note, adding intuitive security and functionality to the banknote. This is delivered via complex windows and striking features, whilst still allowing for control, stability, and performance in the printing process. When designing for polymer, the greatest advantage is the substrate itself becoming an integral part of the total banknote design. Unlike paper, which carries the design, polymer is a fundamental and active participant in the design.

Security Features

Printed on polymer, the £50 has many different security elements layered throughout the design. See through polymer windows, image switching holograms, coloured foil patches and ultraviolet features are all present in the note. These combinations of elegant design, modern security features, polymer substrates and modern manufacturing methods make the new £50 one of the most technologically advanced banknotes today.

A metallic hologram which changes between the words 'Fifty' and 'Pounds' when the note is tilted.

A silver foil patch with a 3D image of the coronation crown.

The Queen's portrait in the see-through window with '£50 Bank of England' printed twice around the edge. (The small clover shapes on the outside of the window are based on architectural features at Bletchley Park).



L to R: Sarah John, Chief Cashier, Bank of England and Ruth Euling Executive Director and Managing Director, Currency at Deben.



A smaller see-through window in the bottom corner of the note, the shape of which is based on architectural features at Bletchley Park.

A red foil patch containing the letters 'AT' is based on the image of a sunflower head linked to Turing's morphogenetic work in later life.

Please visit the [Bank of England site](https://www.bankofengland.co.uk/notes-and-coin) for the new £50 for a complete list of security features.

"The Bank of England decided to move to polymer notes because they are cleaner, safer and stronger than paper notes. Polymer notes provide enhanced counterfeit resilience and increase the quality of notes in circulation."

[Bank of England](https://www.bankofengland.co.uk/notes-and-coin)

Features on the new £50

A photo of Turing taken in 1951 by Elliott & Fry which is part of the Photographs Collection at the National Portrait Gallery.

A table and mathematical formulae from Turing's seminal 1936 paper "On Computable Numbers, with an application to the Entscheidungsproblem" Proceedings of the London Mathematical Society. This paper is widely recognised as being foundational for computer science. It sought to establish whether there could be a definitive method by which any theorem could be assessed as provable or not using a universal machine. It introduced the concept of a Turing machine as a thought experiment of how computers could operate.

The Automatic Computing Engine (ACE) Pilot Machine which was developed at the National Physical Laboratory as the trial model of Turing's pioneering ACE design. The ACE was one of the first electronic stored-program digital computers.

Technical drawings for the British Bombe, the machine specified by Turing and one of the primary tools used to break Enigma-enciphered messages during WWII.

A quote from Alan Turing, given in an interview to The Times newspaper on 11 June 1949: *"This is only a foretaste of what is to come and only the shadow of what is going to be."*

New Banknotes

The Bank of England completed their transition to polymer with the launch of the new Turing £50 on the 23rd June 2021.

The aesthetic design was created by the Bank and passed over to De La Rue to convert the design into a functional, printable banknote.

De La Rue is the sole printer for the Bank of England and from July 2021 will be the majority polymer substrate provider for the £5, £10 and £50 denominations. Every Bank of England denomination is now printed on SAFEGUARD® polymer.

The note uses a large polymer window with a metallic green and gold foil present. Within the gold foil squares Under this, a hologram switches between "fifty" and "pounds" when the note is tilted side to side. The note also includes a tactile emboss feature for the visually impaired.



On the 1st July the Bank of Scotland launched their new £50 featuring Sir Walter Scott and the Falkirk Wheel, continuing the Bridges series of polymer notes beginning in 2016 with the £5.

The new note was designed and printed by De La Rue on SAFEGUARD® substrate and features a clear window with a holographic foil stripe depicting the "Prosperity" statue below the Bank of Scotland headquarters on the Mound with a thistle motif in the background.

The notes include enhanced security features including GEMINI™ and ROTATE™. As with the £10 and £20 notes, the £50 will have a tactile emboss feature for the visually impaired.

Banco Central de Reserva de Peru issued their new 10 and 100 Soles denominations on the 22nd July. These notes incorporate modern designs, new motifs, and new security features.

The 10 Soles features the musician Chabuca Granda with the 100 Soles featuring the scientist Pedro Paulet.

The new notes were designed by De La Rue and feature Enhanced GEMINI™ with Microtext on all denominations.



The value of good design

DLR was invited to present at the recent International Banknote Design Conference. This event is hosted by the International Banknote Designers Association and sought to explore the theme of "Design Value - what does the customer really want, and how to give it to them."

From De La Rue Currency were Alan Newman, Product Director and Alan Eckford, Head of Design who discussed De La Rue's philosophy of how banknote design plays a pivotal role in manufacture and cash cycle performance when delivering true value to the customer.
"True value is distinct from cost".

De La Rue provides secure, functional banknotes which enable citizens to participate in a nation's economy. We deliver this confidence through our banknote design team, it is the nexus point where the needs of visual excellence, public education, counterfeit resilience, cash cycle performance and manufacturing efficiencies come together. Helping maintain the status quo without disruption is the result of the value we add. Alan Newman: "A banknote is a functional document which leads today's designer to have to consider the manufacturing technologies, circulation criteria and of course the artistic impact."

Design plays a pivotal role in banknote manufacturing and the end to end cash cycle. It has to represent artistic excellence, be engaging and invite interaction from the public whilst contributing directly to manufacturing efficiency and circulation performance.

As a banknote printer, substrate and security feature supplier, design is key to De La Rue as an integrator. Making the most of the design integration experience whilst ensuring that customers feel involved in the design process and that they participate and understand, in the process and the key interaction points and even some of the 'banknote language' is a critical part of the design process as it is not unusual that a central banker may only be involved in one new banknote design project throughout their career. In 2020 De La Rue averaged a new banknote design proof every three weeks.

De La Rue believes value lies in integration and being able to incorporate complex material science and technology without compromising the artistry and aesthetics when efficient and functional banknotes for a nation's economy. De La Rue can take ink from one supplier, thread from another, substrate from a third, foil from a fourth and deliver a customer solution, on time across the world during a global pandemic.

Good security is layered throughout a banknote design, and should be considered as the primary means of securing a banknote. Good design is how the public navigates new denominations and interacts with the chosen security features. A well-structured design enables consistency and repeatability when manufacturing.

We model the efficiency and stability of banknote designs using our own software that allows us to monitor the design's performance in manufacturing. Briefly, a digital representation of the banknote is generated considering all the variables that make-up the design and modelled through the manufacturing process, creating a baseline for predicted performance for each of the print processes. We then monitor real time to understand actual performance on key elements such as overall production efficiencies; ink utilisation, spoil, frequency of plate changes, impact on ream shape and machine readability to name but a few. It is from this data we create insights into what aspects of the design can be optimised, continuously developing our design rules and approach to improve the banknote printers experience and ultimately the quality of the product, enhancing value via design.

Two key elements of delivering customer value can be found in the quality and cost of the product. At De La Rue we believe Design, more so our "Design for Manufacturing" approach delivers against these requirements.

With many sources quoting that 75 – 85% of cost is committed at the design stage it is vital we consider impact on the manufacturing and the cash cycle process, pursuing optimised banknote performance. The Focus being preventing the likelihood of defects occurring during the entire product lifecycle. The

"A banknote is a functional document which leads today's designer to have to consider the manufacturing technologies, circulation criteria and of course the artistic impact."

Alan Newman, Product Marketing Director

cost of preventing mistakes and errors is significantly less than the cost of correcting later, thus the need to build in quality via design.

Within the Design Department De La Rue has a dedicated and highly skilled team proficient in banknote manufacturing, quality systems and tools and Six Sigma methodology. The team deliver innovative solutions to increase product functionality at the lowest possible cost. The team work concurrently with the designers at the earliest stages of the design journey developing dynamic risk assessments to minimise impact to manufacturing and the cash cycle process.

Our Design Software has also been adapted to produce automated triggers to highlight areas of risk simulating movement of tolerancing. Visualising potential feature clashes or undesirable aesthetical elements. We develop insights for typical banknote print failure modes such as set-off and through the creation of set-off heatmaps pinpoint areas of the design that may be susceptible to ink transfer and mitigate as required.

Through the application of predictive statistical analysis and early prototyping we simulate how the banknote may perform in manufacturing before it has been produced. Our banknote proofing hall, located in the Design department, has a footprint mapped to all print and surface applications requirements enabling us to produce a fully functional representation of the banknote using materials aligned to those in industrial scale manufacture. This not only allows for opportunity to further optimise certain factors and characteristics of the design to reduce waste and increase efficiency but provides the customer with a prototype proof for absolute sign off, offering certainty before entering full production

As the design matures, the team are preparing for the transition to manufacturing developing comprehensive Quality Control Plans in preparation for manufacturing launch. Here elements of the design that are critical to the customer or carry elements of risk are highlighted. It is based on these customer critical elements and risk we determine the sampling size and frequency of inspection and utilise statistical process control to monitor adherence to specification interacting with the process before defects occur, reducing variation and improving the overall quality of the banknote.

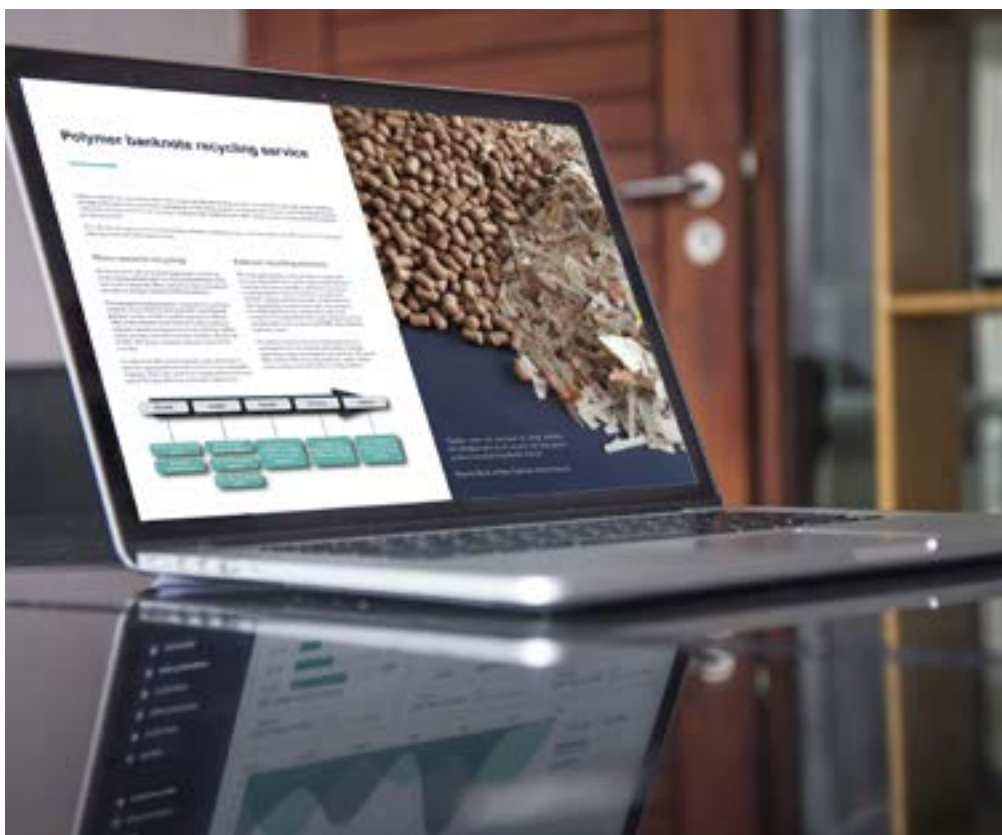
Design has a significant influence in determining the sustainability of a banknote. It dictates the manufacturing routing, the usage of material and the energy consumption to manufacture the product. In terms of ink usage (and ink waste) heavy Intaglio coverage generally means more ink waste is washed away into effluent treatment requiring more effort and energy be expended. A complex design that has little or no consideration for manufacturing tolerances could create an increased requirement on production and the materials and energy required to produce it.

At the design stage we can produce a carbon footprint calculation, based on multiple factors and variables that go into the manufacturing of the banknote. The output is an overall banknote efficiency rating. We can then highlight considerations towards the design like substrate selection, feature selection and feature placement to name a few that can reduce the overall carbon footprint. Imagery of the various design options to lower the carbon footprint can be provided to again provide choice, to not drift to far from the initial design requirement and direction.

We can also take existing designs and perform indicative analysis providing comparative data, showing answers to "what-if" scenarios such "what happens when I convert my current paper design to polymer?"

As part of our drive toward greater environmental accountability and transparency, Design now tracks the environmental impact of each banknote design. This means we can calculate the greenhouse gas emissions, energy consumption and recycling options for any banknote design. When combined with our environmental impact assessments and cost-benefit analyses, De La Rue can provide a detailed series of insights to customers looking to understand change or update their banknotes and meet their climate goals.

The role of banknote design is integral in creating the framework for the aesthetics and the core of modern banknotes. The value of the banknote designer's role will increase to consider more of the circular economy of banknotes, and the influence of how design decisions will impact this.



As a global manufacturer De La Rue is ranked #24 in Europe's Climate Leaders of 2021 ([FT.com](https://www.ft.com)). We achieved this ranking due to our efforts in reducing our environmental impact and our ability in implementing a robust means of data capture and environmental impact assessment which enabled us to measure and report on our activities in an acceptable way.

De la Rue is responsible for five production sites worldwide, to be able to measure the activities and identify methods of improvements we needed a standardised method of capturing and assessing our data. We use primary data from our production processes and from suppliers of key materials such as substrates, inks and materials used in security features. Background data for electricity, materials and waste management processes have been sourced from the GaBi 2019 database. The model was built using the GaBi lifecycle assessment (LCA) software. Our LCA models are built in accordance with the Life Cycle Assessment standard ISO 14040:44. Using this combination of data and approved standards enables us to create accurate and verifiable reports to drive informed decision making. By building on this data and learning how to use the software available, we were able to achieve new and different things.

Analyse

A benefit of a good data analytics tool is that they can lead to unintended innovations by allowing manipulation of the dataset in different ways. This ability to manipulate data sets to meet changing requirements and solve new

problems is essential.

Report

When measuring internal processes and improvement an element of standardisation and repeatability is necessary. De La Rue uses this method to measure environmental performance metrics across our production sites enabling us to provide consistent company wide reporting.

When producing reports and solutions for customers, we combine parts of our dataset with (verified) externally provided data to create reports such as "Cradle to Grave" Life Cycle Assessments for the issuance, circulation and destruction of new banknotes. We generate cost benefit analyses that can calculate

cost, volume and GHG emission reductions if an issuing authority were to convert to polymer substrate. We can also integrate specific external requirements into our modelling when calculating the impact of introducing a new series into an economy.

Having a good data set and being able to use it effectively empowers better informed decision making. De La Rue uses data to drive our decision making and shape our actions. We share aspects of this through our teams of experts and our (triple) award-winning DLR Analytics™ software which enables the environmental impact of the cash cycle to be estimated via banknote demand forecasting, note circulation metrics and note life assessments.

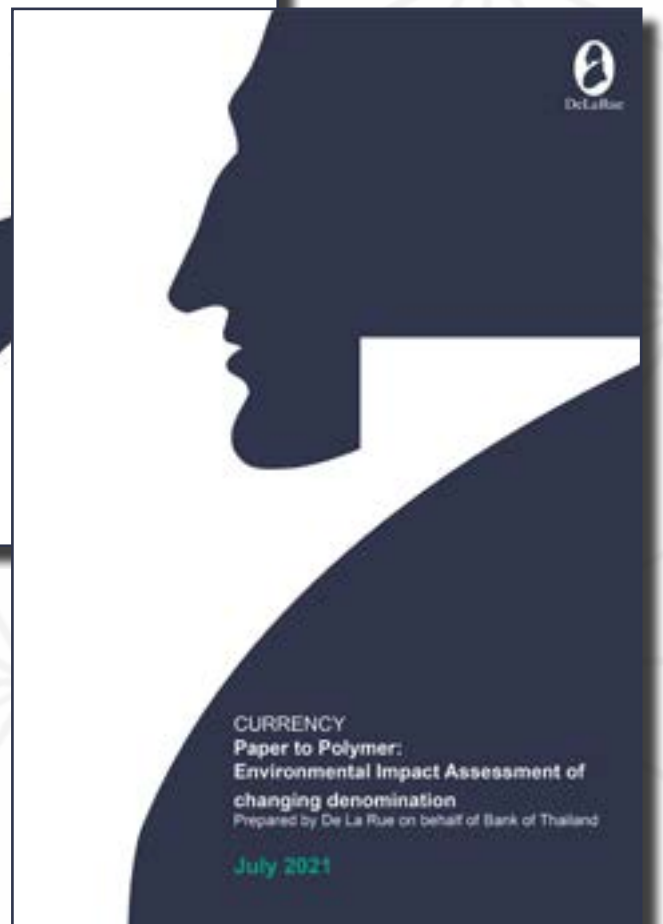
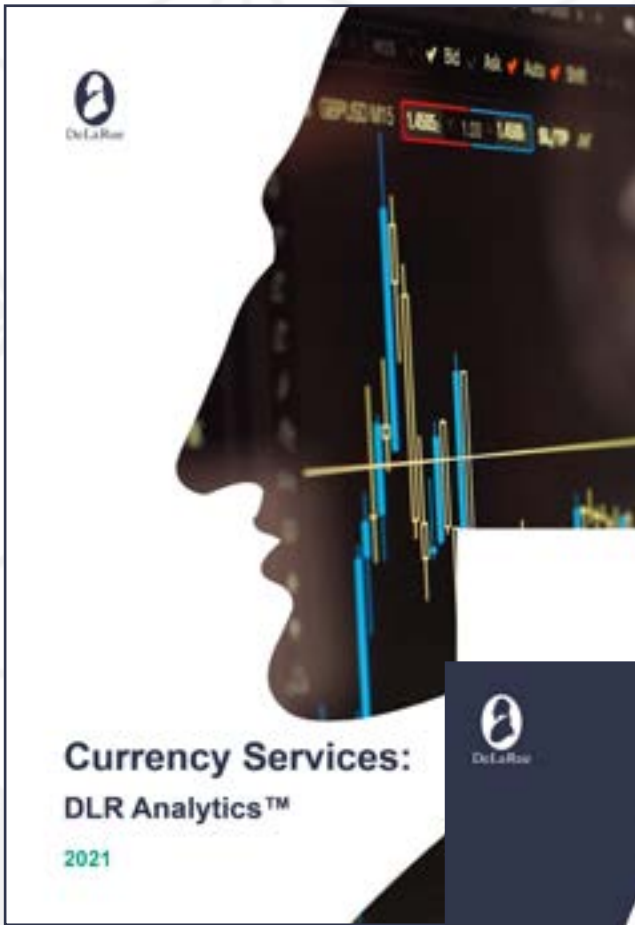
By providing data driven services, we can recommend the most appropriate solutions that meet our customers' needs and geography. We support our analysis and assessments with practical solutions which do not constrain our customers to a single solution for substrate choice, feature selection or end of life disposal. By using reliable data in a transparent way, we can make well-informed environmentally responsible choices that benefit everyone who uses cash.

Data Driven Services

De La Rue provides a range of data driven services to help our customers make informed decisions about every part of their banknote life cycle. We support these insights with our expertise and practical solutions for substrate choice, feature selection or end of life disposal.

We can provide Environmental Impact Assessments, Cost Benefit Analyses for polymer conversion, cycle analysis tools and end of life banknote solutions. Please contact us to learn more.

currency@delarue.com



POLYMER SECURITY

*Dr Nikki Strickland
Head of Product Marketing
De La Rue Currency*





Large surface area and high visual impact.

The window in the polymer banknote is proven to be a strong security feature, here's why...

Clear and obvious

The large area of a window means that they are highly impactful; the presence (or absence) of a window is more binary and more obvious than that of a watermark. Billions of people authenticate a banknote by holding it up to the light to check for the watermark, polymer windows play to this habit, although it can also be more subtly checked.

Difficult to replicate

Polymer windows are also virtually impossible to simulate as they are part of the substrate. Most counterfeit banknotes are still produced on paper and paper counterfeits can't simulate polymer windows convincingly. The latest window designs are large, shaped to integrate into the banknote design and include complex print detail.

Modern Aesthetic

These new windows create a modern aesthetic whilst also being virtually impossible to cut-out, compared to older die-cut windows in older banknote designs. Paper-based counterfeits of polymer notes rarely pass as genuine notes because they lack a window or have an extremely low-quality window.

There is a reason that paper is still used when counterfeiting polymer banknotes. Polymer is not readily available at banknote-grade thickness and a different thickness or stiffness will act as a trigger

that something is wrong. In the unlikely event a suitable thickness is sourced then the inks from commercial printers don't readily stick to polymer. There is a reason De La Rue's scientists spent years optimising the ink and processing conditions for our SAFEGUARD® polymer substrate.

Opacity

In the rare event that a counterfeiter overcomes the challenges of sourcing and printing on polymer some of the depth of thought behind polymer window designs may be surprising.

White ink forms part of the window to force additional counterfeiting steps – the photocopier sees the see-through window as being white and so loses the white ink detail upon copying. If this is overcome by putting something coloured behind the window there are then different process steps needed to stop the window being coloured. The window can also include some colour, which requires perfectly registered white underneath. Specialist inks (like ARGENTUM™) and security features (like ROTATE™ or MASK™) enhance the security feature further.

Polymer windows are highly secure. The factors above (and a few others) combine to explain why the polymer counterfeit rates remain low today even when most polymer banknotes are secured by 'just' a window.

Where banknote issuing

POLYMER SECURITY

authorities and central banks need additional security then the polymer windows can additionally incorporate a banknote-grade hologram. Recent examples include the Bank of England and Bank of Scotland £50 banknotes. Central banks such as the Bank of England, Reserve Bank of Australia, the Bank of Canada and the Reserve Bank of New Zealand have chosen to protect their series with holograms in the window of the polymer and this feature has been cited as the best way to secure a banknote.

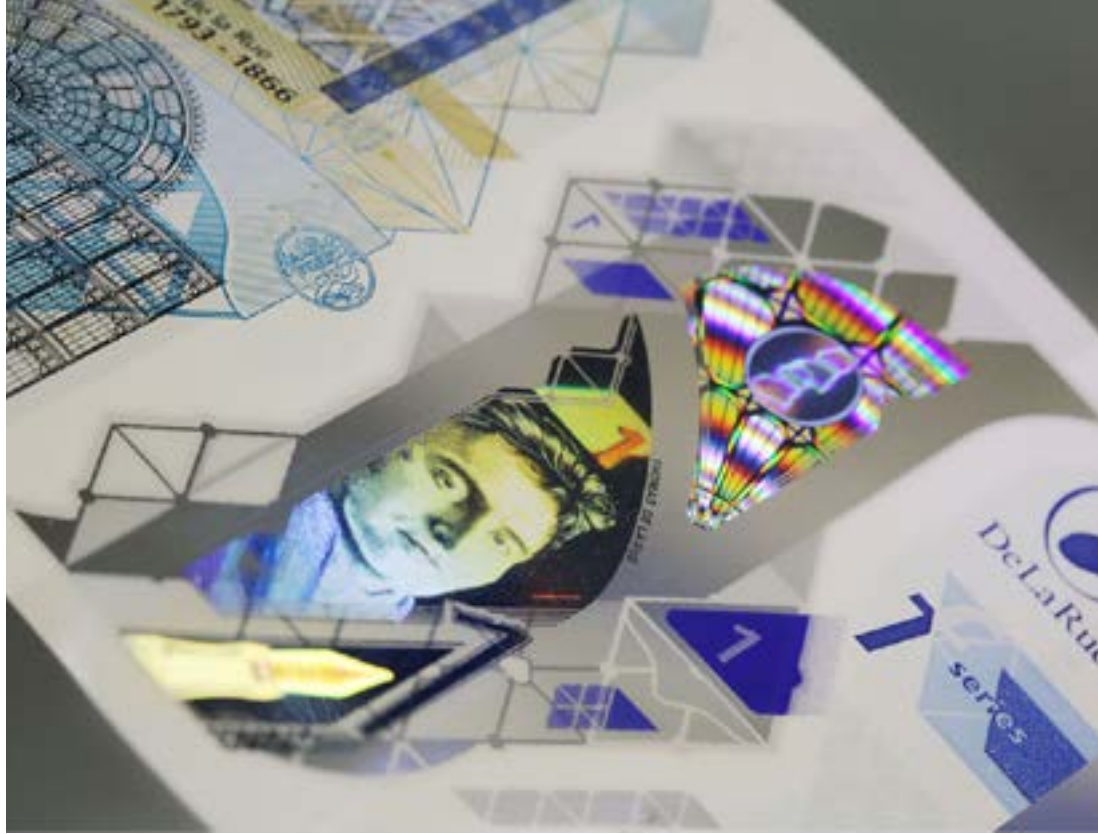
Windowed Holographics

Combining holographic effects with polymer windows bring the greatest security for polymer banknotes. Polymer windows display both sides of the holographic effect, ensuring the security features remain visible however the note is passed to someone. This capability is unique to polymer.

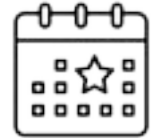
Banknote-grade holographic effects come with a level of interactivity, dynamic movement, and detail that is virtually impossible to counterfeit. Commercially available machines and holograms are simpler, often lacking the depth, movement, or colours of their

banknote-grade equivalents.

When to specify a hologram in a polymer window depends on the counterfeit threat. For lower value denominations and areas where the threat is lower, specialist inks and clever design may be adequate. Where the counterfeit threat is higher or when central banks want to future proof their higher denominations, a holographic foil in the window of a polymer banknote represents the ultimate in banknote security.



Events



Click here to visit the
Currency events page

Approaches to Central Bank Digital Currencies

14 September 2021
De La Rue Webinar

Join De La Rue for our first webinar on the topic of Central Bank Digital Currencies (CBDC). We will be discussing what CBDCs are; how they might work and what they mean for the future.

This webinar is intended to share knowledge and provide a forum for discussion for industry professionals.

If you would like to participate, please register your interest at currency@delarue.com.

Banknote Recycling and Destruction

24 November 2021
Webinar

If you would like to participate, please register your interest at currency@delarue.com.

Banknote & Currency Conference

21 - 24 February 2022
Washington DC

If you would like to participate, please register your interest at [Currency Research](https://www.currencyresearch.com).

Global Currency Forum

2 May 2022
Barcelona

If you would like to participate, please register your interest at the [Global Currency Forum](https://www.globalcurrencyforum.com).

We provide banknotes that central banks and issuing authorities can be proud of.

Our market-leading Currency Division provides banknote security features, polymer substrate and fully finished banknotes to central banks, banknote issuing authorities and state printing works around the world.

De La Rue banknotes are more than just currency – they are secure, functional and beautiful products that countries can be proud of. They represent the very best of British design and innovation by capturing the richness of the cultures they represent with originality and creative flair.

Today's De La Rue is a progressive global company, with international manufacturing expertise, building on a heritage of customer focus, invention and expertise. We value our role as a trusted and long-term partner to banknote issuing authorities and respect this role by striving to offer the best products, support and services, via a seamless experience from start to finish.

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Join us on social media. Get access to De La Rue opinion, events and our latest news and views on cash and currency around the world. We will keep you informed on what we are doing and what matters to us.

We welcome your suggestions, ideas and comments. Please send these to [Nikki Strickland](#) or [Richard Sokl](#).

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