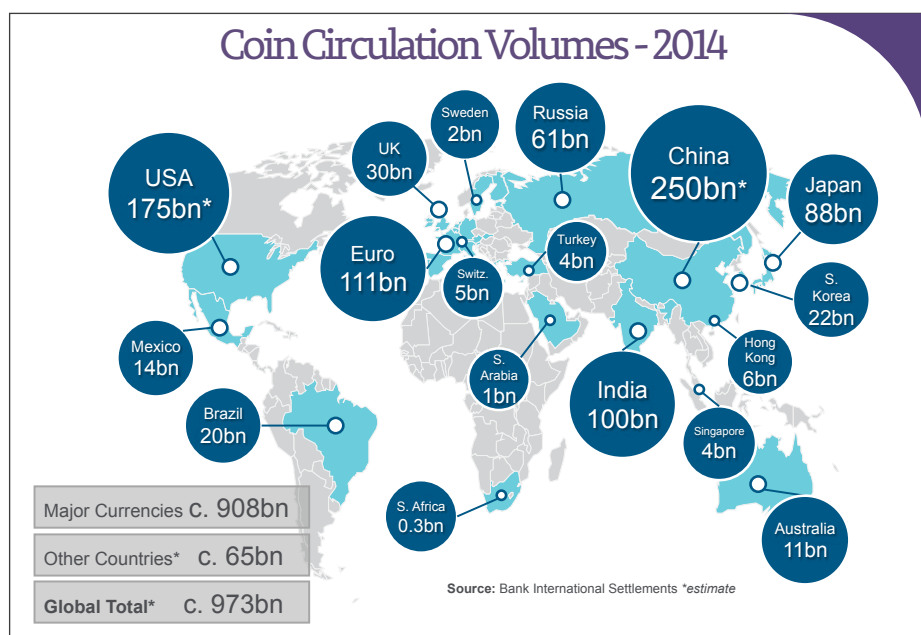


MINT NEWS QUARTERLY™

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Growth, Drivers and Trends



Good news: the demand for circulation coins has increased.

In her opening lecture at The Coin Conference in Madrid, Astrid Mitchell tracked the most important developments in the world of circulating coins and forecasted challenges and chances.

To begin with – the positive news: the demand for circulating coins has not decreased, quite the contrary. While, in 2012, 846 billion coins were in circulation, the volume has increased to 973 billion in 2014. The annual coin demand rose from 42 billion to 49 billion in the same period.

Almost one in two coins, 49%, is still made of a homogenous alloy. Plated coins, however, are on the increase. They currently make for 38% of all issues. With a share amounting to 13%, the bi-colour coins have likewise gained ground. They are found primarily in the range of higher denominations.

With this change, two fundamental developments were touched upon, both of which are the result of the growing cost pressure:

- More and more central banks are considering options to produce their smaller denominations in a less expensive way, or if they should remove the lower values altogether;
- At the same time, more and more countries are discussing raising the coin/note boundary.

Smaller denominations

In previous years, the increase in prices for non-ferrous metals, as well as high energy and personnel costs, have led to higher costs in the production of coins to the extent that, especially with regard to smaller denominations, the manufacturing costs exceed the nominal value and lead to a negative seigniorage. Furthermore, it is precisely the smaller denominations which disappear from circulation.

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More Than Just Lectures

I like conferences. They give me the chance to meet in person those I usually only know from their signatures at the end of an email. In today's society, the personal contact cannot be overestimated.

This is why, when attending a conference, I make a point not only of listening to the lectures but also being present at every single break, as this is my chance to establish new contacts. I have only one ulterior motive: getting to know the other person better.

Hardly any other discipline provides the opportunity to come to know and to like so many people from so many different nations. This is what I like about the coin industry: the diversity of the people involved, of the opinions, concerns, problems and solutions.

Therefore, in this *Mint News Quarterly*™ Special Issue on The Coin Conference in Madrid, I can't give an account of the conference's most important element of all. It lacks the smile and the friendly words, it lacks the speechlessness of the delegates when the Spanish Mint surprised them with a magnificent concert in a festive setting, it lacks the fantastic serrano ham with which Sempsa brought honour to its home town, and it lacks the jokes you made with complete strangers because you lost your way to the lunch buffet in the somewhat confusingly designed hotel.

A big compliment goes to the organisers of the conference, to Astrid Mitchell in particular, who kept her cool even when a speaker cancelled his presentation only a few hours in advance.

In this *Mint News Quarterly*, you can easily see how exciting the lectures were. We have summarised some of the most interesting contributions for you. And because of all the things you find lacking, I can only recommend not missing the next Coin Conference in 2017.

Ursula Kampmann, Editor

Growth, Drivers and Trends *(Continued)*

The central banks face two problems, therefore. How can they produce the smaller denominations in a cheaper way? And how can the hoarded coins be returned to circulation?

The first problem can be solved by cheaper production processes and less expensive raw materials. The trend is towards smaller, lighter coins. Another option is the plated steel blank. The radical solution is the abolition of the smaller denominations altogether. In the past two years, Barbados, Ireland, the East Caribbean Central Bank and Tonga have decided to go this way.

As regards the hoarding of the smaller denominations, there are many individual actions, but no universally accepted solution. Collecting boxes for the smaller denominations to donate the coins to charity are a known sight throughout the world.

Hong Kong has developed Coin Carts which go to the people and try to motivate them to exchange their smaller denominations free of charge. The Philippine state prohibits the hoarding of small change under threat of punishment.

In fact, one of the main problems seems to be that the market participants have no inexpensive opportunity to exchange their accumulated small change, because banks and private companies pass on the cost incurred by the smaller denominations' logistics to the customers and so render the exchange unattractive.

Coin/note boundary

Having a longer life-span, coins are cheaper to produce than banknotes in the long run. For this reason, many central banks are considering raising the boundary between coins and banknotes.

Three aspects have to be taken into account:

- How would this action affect public perception? Would it be perceived as an indication of inflation, thus fuelling inflation?

- How great are the costs incurred by the changeover for the market?
- Can a coin be as secure as a banknote?

In the past two years, a few countries have shifted their coin/note boundary: Bulgaria, El Salvador, Iceland and Tanzania.

In Sweden, on the other hand, politicians have consciously decided to not follow this approach.

Nevertheless, many mints are working on new features to eliminate the security risk for the higher values. A number of such security features are close to the maturity phase or have already undergone a few test-runs. The latest developments rely on different elements:

- On colour, applied by laser printing or pad printing, or produced by means of nanotechnology;
- On materials, as in the tri-metallic coin, the flip flop coin, the polymer coin, and *Plamet®*, a completely new composite material invented by Goznak;
- On specific minting technologies, as currently applied in Quadruple Latent Images or the *MintMark SI®* innovation, which features a hidden engraving that is only visible by means of an additional lens;
- Other technologies add to these, as the Finnish *CoinTune™*, the *Canadian Coin DNA* for bullion coins, and the British high security feature that is being applied to the new £1 coin for the first time.

How important it is to be way ahead of the counterfeiters in terms of technology, when a new coin series is planned, is illustrated by the success of the euro coins. Exhibiting advanced security features at the time they were introduced, euro coins are rarely counterfeited to this day.

Out of 102 billion coins in circulation, only 184,000 counterfeit pieces, with a value adding up to €288,000, were taken out of circulation in 2012. For comparison, it is estimated that nearly 3% of all circulating British £1 pieces from 2008, which is based on a well-known technology, are counterfeit.

How many mints?

55 mints are currently producing the global annual coin demand of 49 billion coins. This makes an average production of 0.9 billion coins for every one of those 55 mints. If we compare this with the banknote industry, it is striking to see that only a few more banknote printing companies – 62 worldwide – achieve a considerably greater output amounting to 170 billion banknotes. This makes an average production of 2.75 billion banknotes per printer, meaning that the banknote industry is much more efficient.

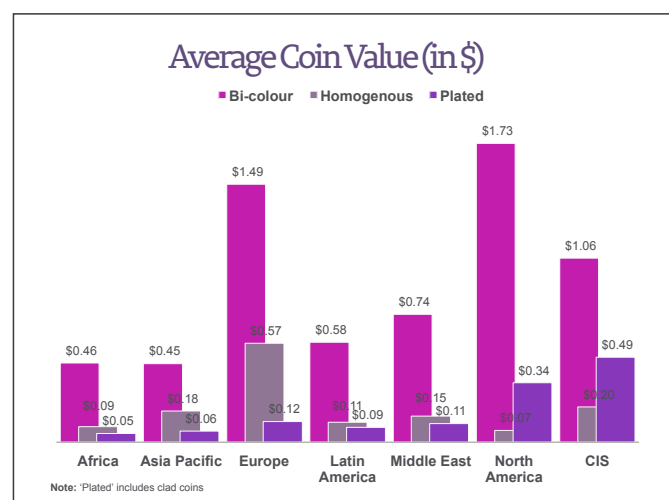
Hardly any mint is fully stretched today. Existing overcapacities lead to ruinous price wars over external orders. If more states decide to abolish their smaller denominations, the situation will be further exacerbated.

The mints are left with only a limited number of options:

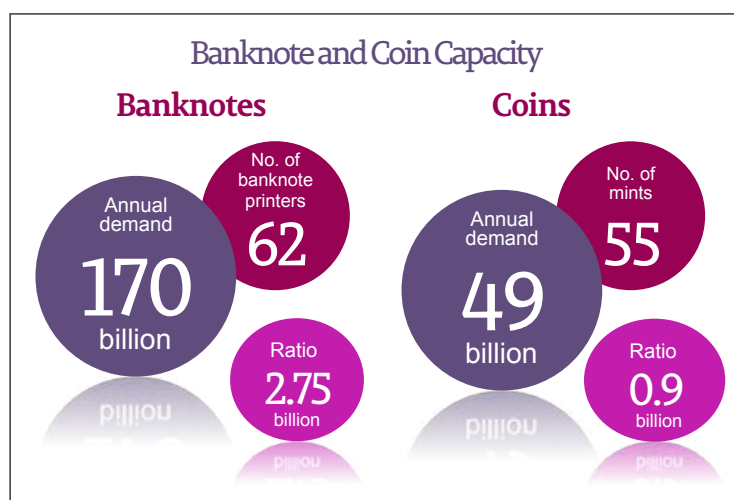
- Invest and expand to improve their order situation;
- Privatised;
- Diversify.

Those unfit to survive in the increasingly tight market will be forced to close down if they have not made it sufficiently clear to their own government that operating a mint is a matter of national importance.

As can be seen, there are challenges ahead, likewise when it comes to competing with alternative means of payment. Only if a coin remains user-friendly, cost-effective, available, secure, and attractive, can it stand up to cards and other payment means.



While plated steel occurs mainly for smaller denominations, bi-colour strikes are used for high denominations.



Compared to the efficiency of banknote output, there is still some room for improvement in coin production.

Cost Efficiency: Three Approaches to Reducing Minting Costs

It is not a new problem. All central banks are considering ways to ensure a cost efficient coin supply for their population. Within the framework of The Coin Conference, representatives of the central banks of Sweden and Mexico, and the US Mint, presented their approaches. They differ significantly from each other.

In 2008, Sweden assessed if it made sense to issue both new banknotes and coins. With the banknotes, the security issue was considered particularly important, whereas in regards to the coins, questions revolved primarily about cost efficiency and environmental issues.

In 2009, it was decided to carry out a large monetary reform, in which all denominations, except for the 10 krona coin, should be replaced. The Riksbank is bearing the costs for the production of the new currency, for public relations as well as for the storage of the old and the new coins. All other costs incurred by the changeover have to be paid by the stakeholders and the market participants.

But not all measures to increase cost efficiency could be implemented for political reasons. It was not possible to raise the note/coin boundary, for example. The Swedish Parliament did not approve the replacement of the 20 krona note with a coin.

The currency changeover is generating high costs for the market and its representatives have been closely involved in timetabling. While the Riksbank had initially planned to conduct a long transitional phase, the market wanted to be given much more time for making the necessary preparations but less time for the actual changeover.

Therefore, the changeover was divided into two steps:

- The first step from October 2015 to June 2016, in which the lowest and the highest banknotes are completely replaced and a new 200 SEK banknote is issued;
- The second step affects all coins plus the banknotes most commonly used in vending machines with a value of 100 and 500 SEK.

A pilot production of the coins was carried out as early as 2012, so that the vending industry could brace itself for the adjustment. Mass minting began in 2015. It is carried out by the Royal Dutch Mint, which, in 2013, was commissioned with manufacturing all Swedish coins, starting in 2014.

The first trial pieces will be available in January 2016. The new coins will be released to the public on 3 October 2016. As of 30 June 2017, the old coins will cease to serve as legal tender.

The new coins are being minted in a much more cost efficient way, mainly thanks to savings in material. They will have a lower weight and be made of new alloys. The old copper-nickel 1 krona coin with a weight of 7g will be replaced by a new coin made of plated steel with a weight amounting to 3.6g. This reduces the production costs from 0.70 SEK to 0.13 SEK. The production costs for the 5 krona coins are likewise significantly reduced. While it used to take 1.50 SEK to produce the old copper-nickel coin in the weight of 9.5g, now it only takes 0.43 SEK to mint the new coin, with a weight of 6.1g and made of Nordic gold.

There are currently about 1.3 billion 1 krona coins and 265 million 5 krona coins in circulation. Since the Sveriges Riskbank assumes that only 30-50% of coins will have to be replaced, 40% of the number of circulating 5 krona coins are required, as well as 40% of the value of the circulating 1 krona coin split in 1 and 2 krona pieces.

The Riksbank expects the following costs for the euro changeover – excluding the costs borne by the market:

Costs	SEK (million)
Purchase new banknotes	250
Purchase new coins	110
Communication	40
Storage of old and new coins	30
Other costs	20
Total costs (approx)	450

How much the Swedish Riksbank can deduct from these costs for the scrap metal of the collected coins will depend on the metal price.

Mexican inefficiencies

For years now, the Mexican Mint likewise has been faced with the cost inefficiency of its denominations. As elsewhere, the problem lies in the smaller denominations which are extremely expensive to produce and, after being issued, hardly ever then return to circulation.

Theoretically speaking, 91 coins per capita of the 10 cent coins are currently in circulation, and 35 coins of the 20 cent coin. Both denominations generate production costs of 30 cents per piece, which results in a considerable negative seigniorage every year.

The reason for this development was a measure which, ironically, was aimed at increasing cost efficiencies. In 2007, the Banco de Mexico decided to use the smaller coin blanks, which are made when the blanks for the bi-metallic 1, 2 and 5 peso coins are punched, to mint 10, 20 and 50 cent coins. The result was small, seemingly worthless coins the people were reluctant to use.

The Banco de Mexico is likewise planning a monetary reform, but, to counter the high production costs of the smaller denominations even before the implementation takes place, the central bank will resort to an action it had already taken with the theoretically still valid 5 cent coin. Since 1997, this coin was produced in only limited numbers, and production stopped altogether in 2005. Supply of this denomination has been declining, and demand has dropped at the same time, to the extent that the 5 cent piece has disappeared from payments without having been officially abolished. No estimates were given on the impact that this may have had on the general price levels.

As for the 10 and 20 cent pieces, mintage was reduced in 2014. The goal is to make the population get used to the fact that these small denominations will no longer be available after the monetary reform. A similar function is adopted by the circulating commemorative coins with a value of 20 pesos, which is a denomination that does not form part of the range of Mexican denominations in circulation. It should acquaint the users with the new 20 peso coins which, in the framework of the monetary reform, will replace the 20 peso note.

Different path for US

Apparently, the US government follows a very different path. The production costs of the smaller denominations also exceed the nominal costs. In 2014, it cost 1.66 cents to mint a 1 cent coin. The nickel (= 5 cents) cost 8.09 cents. Although less than in 2013, mainly thanks to the metal prices falling, the general public still complains about this 'waste'.

In December 2010, the Coin Modernization Act requested the Secretary of the Treasury to assess both costs and alternatives for circulating coins every other year. For this purpose, the Office of Coin Studies was founded.

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Cost Efficiency: Reducing Minting Costs *(Continued)*

In its recent report of December 2014, it summarised the diverse technical efforts to find a more cost-effective material for minting coins. Of greater importance, however, are two other figures: the market will have to bear the estimated costs of \$2.4-6 billion dollars for a currency changeover, which will by far exceed the potential savings of the Mint amounting to \$46-57 million dollars.

Therefore, the 2014 report does not propose any immediate changes of the alloys used for coining, but instead intends to contemplate further alternatives, closely involving the market. The next report of the Office of Coin Studies is slated for 2016.

This article is mainly based on the information taken from the following presentations:

- Mårten Gomer, Sveriges Riksbank (Sweden), Plans for Introducing Sweden's New Series
- Mirna Cortés, Banco de Mexico (Mexico), Mexican Circulating Coins: Recent Events and Future Projects
- Jon Cameron, United States Mint (USA), Stakeholder Involvement and the Search for Low Cost Materials for US Coinage

Powder Metallurgy – an Alternative Production Method for Coin Blanks?

By Gerd Wagner, Reischauer

Powder metallurgy as a manufacturing method is not new, and is well known in other industries such as automobiles and tools. In the minting business, in 2014 Reischauer GmbH established, for the first time, a manufacturing line for coin blanks based on powder metallurgy (PM).

Today Reischauer is producing PM-blanks in silver, gold and copper materials for medals, collector coins and investment products.



The production of coin blanks by powder metallurgy can be divided into three steps. First, the powder is produced by atomising a melt. Secondly, the powder is pressed into a blank, and in the third step the pressed blank has to be sintered (ie. heat treated). The pressing step transforms a loose bulk of powder into the desired blank shape. The pressed blank is now solid and can be handled in a conventional way.

Today Reischauer is able to produce blanks with an outer diameter from less than 10mm to 100mm. That means for silver materials, weights from 1 gram to 1000 grams. The process of heat treatment is needed in order to provide the blank with the final properties which are required for minting and for the desired quality of the coin.

The PM-technology opens the door to introduce unique shape characteristics to the coin and to bring new kinds of minting materials into the business. This was reported at the World Money Fair's Technical Forum in January 2015 ('hd-pro blanks') and recently at The Coin Conference 2015 in Madrid.

The presentation at The Coin Conference 2015 was titled 'New Secure Coins in PM-Stainless Steel – a Feasibility Study'. Stainless steel as a minting material for circulation coins is normally used for low denominations because of its low security level. The material is cheap, its price does not vary much and the material is stainless. Naturally it does not need any kind of surface protection.

Interestingly, this kind of material offers certain qualifications for changing its electromagnetic characteristics, which makes it attractive for higher denominations featuring an increased security level. The electromagnetic behaviour of stainless steel can be changed by mixing different powders, which transfer their individual characteristics into the new formed composite material.

For example, a dual-phase composite material can be generated with a non-magnetic FeCrNi-matrix with incorporated ferromagnetic FeCr-particles. The material's electric conductivity is low and the relative magnetic permeability is in the range of 40 to 70. The combination of a low electric with a low magnetic permeability is unique, because it would not be achievable by standard coin materials. The electromagnetical fingerprint could be clearly matched to the new dual-phase composite material.

It is a perfect example of the opportunities powder metallurgy is offering to allow the introduction of new minting materials.

When pressing the powder, a flat pair of dies is not necessarily required. Using profiled pressing dies the blank can be pre-shaped. The shape and the geometry of the profile could be a pyramid or a cone or a spherical segment corresponding to the motif of the coin to be minted.

It is also possible to place additional material on top of the blank where it is needed for minting.

Below shows a profiled blank with a broad and thick edge and a thin base plate. The blank is used for a minting where the ratio of the relief-volume to the total volume of the minting differs by more than 25%. This is really a lot compared to conventional circulation coins, where the relative volume of the relief is less than 10%. The high relief volume is due to the pre-shaped blank.



The crystallographic structure of a PM-manufactured blank is different to a conventional one. Its ductility is significantly higher. Ductility means the ability of a metal to flow plastically under pressure. With the same minting pressure, PM-blanks make it possible to strike a higher relief of the coin.

The three features mentioned – the unique electromagnetic behaviour, the special shape of the coin and the high relief – could be combined with each other and they increase the security level of the coin as well, since they make the design much more attractive and good-looking. The beauty of a coin should not be minimised when regarding public acceptance – bearing in mind the on-going competition between coins, notes and cash-less.

Yes, powder metallurgy could be an alternative production method for coin blanks. This is what Reischauer is currently demonstrating in silver, gold and copper materials for medals, collector coins and investment products. Regarding materials and blanks for circulation coins, the results of the feasibility study are promising, but more research work on the technical as well as on the economical side is needed.

Specifications for Coin and Coin Blank Tenders – The Do's and Don'ts

By Thomas Königer and Davorin Dragas

Each nation is unique. And just as unique are the wishes and ideas of the national central banks in regards to the national currency. Not unique at all, however, are the aspects that need to be considered before a specification for a coin blank or a final coin can be established. Use this catalogue of questions when you aim at establishing optimum specifications for a new denomination.

Size, thickness, diameter, edge height and alloy are by no means the only aspects that have to be considered when working on new specifications. In order to find the optimal specifications, you should reflect on the following nine issues:

1. Security

This was and still is the crucial aspect when it comes to specifications. Weighing the costs, it is vital to establish such specifications for the higher denominations that make it as hard as possible for counterfeiters to imitate a coin, while ensuring it is still machine-readable. This aspect is less significant when it comes to smaller denominations, as well as coins that are not used for vending machines. A particular vital aspect for the specifications is the question of which overt and covert security features the coin should be equipped with.

2. Public perception

Whether or not the general public accepts a coin is largely due to the extent to which this coin meets public expectations. It is advisable, therefore, to choose specifications which tie in with the expectations of the general public in terms of shape, size, weight and colour.

3. Seigniorage

Of course, each central bank would like to get as high a seigniorage as possible. The metal prices being quite volatile, it is hardly possible anymore to calculate long-term price increases for non-ferrous metals. Nevertheless, it should be ensured that, at least for a period of 5-10 years, the value of the metal does not exceed the nominal value under normal market conditions.

4. Coin handling

The precise definition of the packaging is an often underestimated issue. This is of the essence for the resulting logistics costs. Packaging should allow for problem-free handling of large quantities – during transport, production and storage.

The requested packaging materials should conform to worldwide standards. And, last but not least, the climatic conditions of a specific country have to be taken into account when it comes to selecting sustainable and safe packaging methods.

5. Coinability

Some materials are better suited for being coined than others. The reason for this is the hardness of the material. The harder it is, the more pressure must be used in order to mint a coin and the greater the coining dies wear. It must also be taken into account that new, higher reliefs of the coin image may lead to additional requirements on the coinability of a blank. The decision in favour of a specific, perhaps cheaper, material always generates follow-up costs for the minting, which should definitely be coordinated with the mint experts.

6. Social responsibility

A central bank is more than a business enterprise. It represents all the citizens of a nation. Coins circulate as an ambassador of a country, which is why steps should be taken to avoid any negative associations. Consequently, it is necessary that the specifications also include requirements as to the information given about the ecological footprint of the production methods. No central bank can afford to commission a company which does not meet the basic compliance requirements or whose production methods cause long-term environmental damage. Health risks linked to coins should also be considered to avoid bad publicity.

7. Durability and recycling

The big advantage of a coin, against a banknote, is its life-span. The estimated average life-span of a coin currently amounts to 15 years minimum. Depending on differing expectations, different metal combinations may seem more or less attractive.

Coins are made of metal and therefore possess a material value even when withdrawn from circulation. How important is it for the national bank to regain this value? It can either be quite easy or very difficult to dismantle different coin blanks into their basic tradeable components. The environmental aspect should not be neglected in the recycling either.

8. Coin tourism

You should never underestimate the resourcefulness of the people living in your country. If there is anywhere in the world where a denomination is suitable for vending machines, instead of a local denomination with a higher value, they will certainly find it quickly.

Therefore, it is of vital importance that the specifications of each coin prevent it from being confused with another coin.

9. Monopolies

It is never a good idea to choose a coin blank/coin type which only a single supplier can deliver. There is a high risk involved that the supplier misuses their monopoly position to generate considerable price increases. It is also worth remembering that a provider might not be around in a few years time. Therefore, it should be ensured that there is not only one single supplier available, but as many suppliers as possible who are all able to deliver a coin blank or coin at a competitive price.

It is only after all these issues have been taken into account and after one's own priorities have been set that the time has come to define the specifications. But even here there are still many pitfalls one may stumble into.

Misunderstandings are inevitable when everything seems to be clear. Particularly dangerous are situations in which people communicate with each other, but use a different terminology. Imagine the misunderstandings that may arise in the area of examination. You can take 2,140 different measurements on a freshly delivered coin. In the worst case, a deviation of a single one of these 2,140 measurements can lead to the rejection of the entire tranche of freshly delivered blanks or coins.

This affects not only the supplier who is faced with significant losses and financial penalties. The rejection also causes trouble for the central bank which is forced to adjust its schedule. Commissioned with further processing, the mint comes under pressure of time.

Because of that, it is in the interest of all business partners to spend time on defining the specifications as precisely as possible in advance, before making a contractual agreement about the expectations of the central banks and the ways with which it intends to check whether or not the supplied products meet these expectations.

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Exchange Machine for 150 Currencies

At King's Cross Tube station in London, Fourx has installed a kiosk that accepts coins from more than 150 currencies and exchanges them for euros, dollars or pounds. It might provide the solution for returning hoarded small change to their countries of origin.

'The idea was born out of frustration', Jeff Paterson, co-founder of Fourx, told the BBC. 'I had a whole lot of money lying in a drawer that I could do nothing with as the value of exchanging it outweighed the value of money.'

The new exchange machines, the first of which was installed at King's Cross on 26 October, should provide the solution. It offers customers the service of exchanging coins and banknotes from more than 150 currencies – including those already out of circulation – at competitive exchange rates.

The exchange machines are also intended as a simple and inexpensive alternative to traditional bureaux de change.

According to statements to the BBC, the technology is based on image recognition. It is not known which additional methods of measurements are applied in order to exclude the assumption of counterfeit coins from 150 currencies.

The concept has received advance praise. It won Virgin Media's 'Pitch to Rich' competition, thus beating 2,500 other ideas to the prize. The remaining part of its investment was raised via crowdfunding. The founders of the company reached 244% of their £275,000 target in two weeks.

400 kiosks are planned to be installed in London by the end of 2017. They may be a competitor for the traditional collecting boxes at airports, since the users of the kiosks may also donate the inserted cash to charity.



Specifications *(Continued)*

Please make sure to observe the following Do's and Don'ts

Don'ts	Do's
Never formulate a specification in a hurry. <i>What remains unclear must be clarified time consumingly anyway.</i>	Instead, take your time to consider all advantages and disadvantages of every detail of the specifications.
Never entrust a technically incompetent person with making a decision concerning specifications. <i>'Common sense' is not enough to make complex technical considerations and arrive at the optimal solution.</i>	In the best case, an experienced technical manager is the one in charge of defining the specifications, in consultation with all other parties involved who contribute with their special knowledge (central bank, logistics company, mint).
Never use colloquial language when formulating specifications. <i>The more terms technically devoid of sufficient content are used, the more likely misunderstandings become.</i>	When defining specifications, always give precise, measurable details.
Do not assume that your contract partner masters your local language. <i>Even if your contract partner appears to have a perfect command of your language, misunderstandings may arise when it comes to technical terms.</i>	Therefore, you should always account for linguistic misunderstandings. Making a query takes little time but can save you considerable costs.
Never make any unclear definitions as to which testing methods will be applied in what way. <i>It is only fair that your contractual partner knows exactly which tests his products will undergo.</i>	Not only clearly define the testing methods applied but also what is examined where and how, using which device and which parameter.
Do not forget the tolerances. <i>Each manufacturing process has smaller and larger tolerances which are important for the coin characteristics.</i>	Therefore, determine the exact tolerances for each specification.
Do not expect the impossible. <i>The wishes of central banks sometimes encounter technical limits. Do not expect your supplier to make the impossible possible.</i>	You should be realistic in your expectations.
Do not think that your own ideas are self-evident. <i>Whoever thinks they are has opened the door to conflict.</i>	Talk with your contract partner about every single detail. This is the only way to prevent misunderstandings in the preliminary stages.

Quadruple Latent Image

In his lecture at The Coin Conference, Eugenio Gomez presented the latest achievements of the Real Casa de Moneda – Fabrica Nacional de Moneda y Timbre (RCM-FNMT) with respect to further developments in latent image technology.

For 20 years now, the Mint has worked with latent images. It introduced them for circulating coins in 1993, and the 500 peseta coin used to be equipped with this additional security feature until the introduction of the euro in 2001.

Latent images serve as an attractive asset for commemorative coins. They can be integrated into the depiction in various ways. This technology both allows for simulated movement and the depiction of different attributes on a par.

Now, a quadruple latent image has been successfully developed, a security technology which the RCM-FNMT has patented.

The technology is based on a field consisting of four-sided pyramids that operate like dots in a printed image. Those sides of the pyramid that are in the same angle form the complete image. Every pyramid having four sides, it is possible to create four distinct images.

The viewer maintains a fixed direction with reference to a light source: each pixel could either show, or not show, a side that reflects that light. In order for the engraved grooves to reflect light, the angle of each must be varied to face one of the four possible directions.

These delicate details are produced by engraving a master punch with the latest laser technology. This master punch is used to sink the die.

So far, this new technology has been limited to commemorative coins, but it may also be applied to circulating coins. The RCM-FNMT has many years of experience with latent images in circulation. Tests run on the new quadruple latent images have proven that latent images, despite light wear when circulating, continue to be recognisable.

Mass production is guaranteed because quadruple latent images can also be produced with high-speed coining presses.



The commemorative coin: proclamation of King Philip VI.



The commemorative coin features four different images, hidden in a latent image. The quadruple latent image is based on the four sides of a pyramid.

Maarten Brouwer Resigns as CEO

The Managing Board and Advisory Board of the Royal Dutch Mint announced on 5 November 2015 that Maarten Brouwer is resigning from his position as CEO of the Royal Dutch Mint as of 1 December 2015. His employment period will end at a later date and he will stay on as an advisor until then.

The reason for this decision is serious operational and financial problems that have risen in the execution of a large and complicated production order by Chile that have led to a substantial loss for the organisation.

The Mint says it is sure to overcome this problem and strives for a return to its former strong financial position. Since privatisation in 1994, the Royal Dutch Mint has constantly shown positive financial results.

The resignation of Maarten Brouwer will also affect the international Mint Directors Conference, as he has served as Secretary General on the Council of the MDC for many years.

Since 1 December 2015, the position of CEO is being filled ad interim by Kees Bruinsma.

Correction

The Mint of Finland has informed us that we misquoted them in our article 'Security Features by Comparion' in our Mint News Quarterly 3 / September 2015, page 3.

They are certainly willing to produce coins featuring the security feature *CoinTune™* for other central banks. It has not yet been decided whether this will be done for other mints, too.

We apologise for this error and are happy to put the record straight.

400 Years of Madrid Mint

In 2014, the Royal Spanish Mint in Madrid celebrated its 400th anniversary. The beginnings of minting in Madrid stretch back even further. In 1467, Henry IV, King of Castile, founded a new mint in his residential city. His old mint, located in Seville, had fallen into the hands of a competitor for the throne. But this first Madrid-based mint was closed again as early as 1471.

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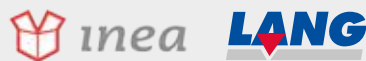
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It was only in 1614 that King Philip III decided to take up minting coins in Madrid again. He appointed the Duke of Uceda to implement this major project. A new building was built overnight where the first coins were minted in April 1615. During the first year, the 121 employees and 14 workers produced hammer coinage from 2,720 kilograms of silver and 35 kilograms of gold, while neighbouring Segovia already used state-of-the-art rolling mills for mass minting.

Soon, however, two problems arose. In all the haste, it had been overlooked that the building was standing on an Arab bath, which led to a number of structural problems. Additionally, more space was needed. In 1660, therefore, a second building was erected, facing the original mint.

In 1709, screw presses were introduced in Madrid. In 1718, King Philip V decided to merge all the country's mints. Furthermore, the state monopolised the minting of coins. Prior to this, private entrepreneurs had been given the opportunity to rent the right to mint or have their own silver coined in royal currency for a fee.

Then the new mint, located in two buildings at the Calle de Segovia, was put into operation. Under the most difficult conditions, the Spanish coinage was produced here for almost 150 years. The two buildings were divided by a street, so the material had to be transported laboriously back and forth.

Furthermore, the buildings lacked space. Under legislation, the staff would have been obliged to reside at their working place. As a matter of fact, it was not even possible to store the material on the ground; so a portion of it was stored in the private dwelling of the mint master. And when a part of the hill behind tumbled down onto the mint, it became clear: Spain needed a new mint which was worthy of the country's standing.

Finding a suitable location, however, was difficult. In 1812, right in the middle of moving, the French occupied Madrid and rendered any change of location impossible. In 1821, an old tobacco factory was contemplated as a new site. But a new invasion of the French in 1823 rendered these plans obsolete as well.

A permanent solution was found as late as 1855. At the Plaza Colón, a completely new, spacious mint was built, which Queen Isabella II inaugurated in 1861. In 1893, the mint was commissioned with the production of stamps, and in 1940 it also started printing banknotes. The mint was aptly named *Fábrica Nacional de Moneda y Timbre*, therefore.

The Real Casa de la Moneda moved to its current headquarters in 1964. It currently also produces ID cards, passports and even lottery tickets. This is likewise the place where, at the highest technical level, the Spanish euros are struck for circulation, not to forget the innovative commemorative issues featuring colour and latest latent image technology.



Detail of the *Topographia de la Villa de Madrid* by Pedro Teixeira, 1656. The original Casa de la Moneda is located in the middle, in the Calle de la Puente at no 29.