FORMULA OF SECURITY

№ 1

GOZNAK

GOZNAK

Dear Ladies and Gentlemen,

Here is the pilot issue of The Formula of Security Magazine – a new corporate edition of Goznak. The company starts publishing a new magazine on the eve of its 200th anniversary – Goznak traces its history back to 1818, when the Expedition of Storing State Papers was founded. The Expedition quickly earned a great reputation of the most cutting-edge enterprise in Russia creating new technologies and accumulating progressive inventions. It enabled the Expedition to achieve prominent results in the field of security of banknotes and security papers.

Goznak (that is how the enterprise has been called since 1919) has preserved and multiplied the best traditions of the Expedition of Storing State Papers. Today Goznak is a leader of the Russian market of security technologies and solutions and competes in the world market of security product manufacturers successfully.

Besides the traditional areas of activity – papermaking, printing and coin and order production – in recent years, Goznak has been actively developing systems of control of documents and banknotes in circulation, as well as providing services of electronic data processing and guaranteed storing.

In The Formula of Security Magazine, you will come across Goznak's cutting-edge developments and unique capabilities.

We will narrate the history of the company inextricably intertwined with that of the Russian currency circulation and the country's history.

We hope our magazine will be both interesting and useful. Moreover, we count on your feedback and offers – they will help us to work upon the next issues.

By the way, The Formula of Security will be issued twice a year.

Thank you for your attention and trust.

Editorial team of The Formula of Security Magazine

editorial team

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content

Elena KISELEVA

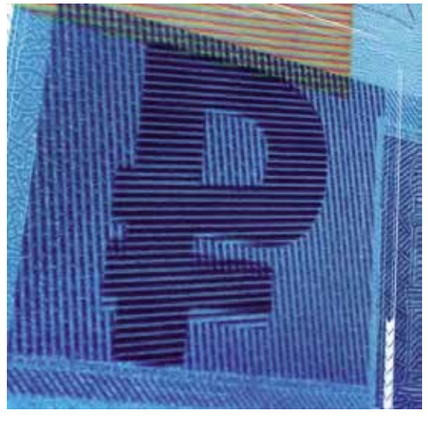
New Generation of Banknotes: Innovative Technologies and Modern Design

In October 2017, the Bank of Russia put into circulation new face values of the Russian banknotes – 200 and 2000 roubles, designed and printed by the specialists of Goznak. Unique features, developed by the specialists of Goznak and protected with patents, were applied in creation of these new banknotes. As a result, the 200- and 2000-rouble banknotes have become a truly innovative product.

WHILE CREATING NEW BANKNOTES, VISUAL SECURITY RECEIVED SPECIAL ATTENTION

BEAUTIFUL AND DURABLE

The modern design of the banknotes was created by a group of artists of the Bank of Russia and Goznak under the supervision of the Consultant of the Division of Currency Units and Counterfeiting Prevention of the Bank of Russia Sergey Kozlov. The 200-rouble banknote exhibits symbols of Sevastopol - the image of the Monument dedicated to the Sunk Ships on the front, and a view of Chersonesos Taurica on the back. The dominating color of the banknote is green.
The banknote is printed on cotton paper of increased density, with polymer treatment, which ensures high wear and tear resistance. According to specialists, this should increase the banknote's durability 1.5 times, compared to other denominations.



A covert image of the symbol of rouble (KIPP-effect)

The 2000-rouble banknote is made mostly in blue color. The front depicts a cable bridge in Vladivostok that connects the Russkiy Island to the mainland of Vladivostok. “Vostochniy” cosmodrome in the Amur Region is depicted on the back.

UNIQUE DEVELOPMENTS OF GOZNAK

When presenting the new banknotes, General Director of Goznak Arkady Trachuk pointed out that the specialists of the Bank of Russia and Goznak focused on creating not only beautiful and visually modern banknotes, but also hi-tech ones. As a result, a truly innovative product was put into circulation.
Goznak specific technologies, protected with 15 different patents, as well as cutting-edge achievements of the global banknote industry were applied in the banknotes’ development. Special attention during the new banknotes’ creation was paid to visual security. Banknotes’ security features facilitate their authentication in circulation without special technical devices.

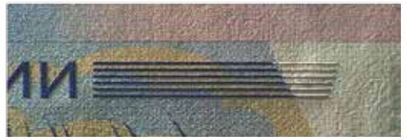
Tactile marks – indication of the face value for visually impaired people

For example, three security features are combined in the security threads; they are observed when the banknote is tilted or viewed at a certain angle as well as in transmitted light. These features can be very easily examined by general population, but are extremely difficult to counterfeit. They represent a unique development by Goznak and the Center of Computer Technologies; there are no equivalent threads in the world today.
Four fragments of the 3 mm-wide windowed holographic security thread emerge to the surface on the front of the 200-rouble banknote.
When the banknote is turned to/from the observer, shiny rectangular elements can be seen moving up and down in the opposite directions from one another on fragments of the security thread emerging to the banknote surface. At an acute angle, the colored image of the symbol of rouble is visualized against the iris background. With the change of the viewing angle, number “200” becomes visible on the monochrome area. When the banknote is turned at 180 degrees (without change of the viewing angle), the color of every number changes. With the angle change, the symbol of rouble becomes visible; it looks dark against light background or light against dark background, depending on the banknote’s location.
In transmitted light, the security thread appears as a dark stripe with bright recurring “200” number.
On the 2000-rouble banknote, the windowed holographic 5 mm-wide thread emerges to the surface on the front of the banknote in shaped windows.
When the banknote is turned to/from the observer, different numbers of the face value can be seen moving up and down in the opposite direction from one another. At an acute angle, repeating colored images of the symbol of rouble are visualized against the iris background. A 3D image of the symbol of rouble is permanently observed between the images of the face value.
With the change of the viewing angle, number “2000” becomes visible on the monochrome area, with every number being of different color.
When the banknote is turned by 180 degrees (without change of the viewing angle), the color of every number changes. The symbol of rouble becomes visible with the angle change; it looks dark against the light background or light against the dark background depending on the banknote’s location.
In transmitted light, the security thread appears as a dark stripe with the bright recurring inscriptions “ЦБ РФ” (the Central Bank of the Russian Federation).

Relief letters of the face value writing

An element accomplished using a special raster

Optically variable elements observed at an angle: HMC covert multicolor element, a latent element (KIPP-effect), an image of the symbol of rouble

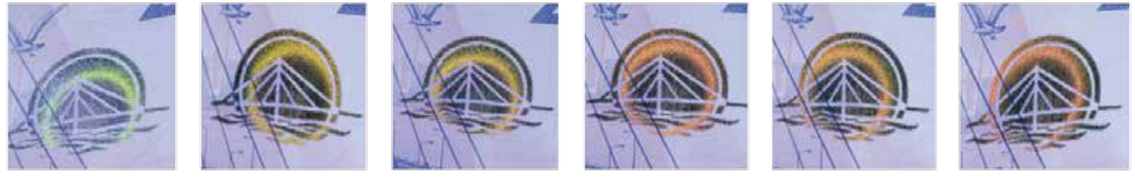


Transfer to blind embossing in intaglio printing

A combined miltitone and filigree watermark on the 2000-rouble banknote

A color-shifting element with a moving bright ring observed when the banknote is jiggled

Overall, both banknotes contain a few dozens of security elements, including machine-readable and expert-level security features.
The security technology developments for the first time applied on the 200- and 2000-rouble banknotes have a great technological potential and will be applied by Goznak in the future for innovation and renewal of the banknotes.



Elena KISELEVA

“Banknotes 2017” application:

pictorial, convenient, technologically simple

THE MOBILE APPLICATION WILL FACILITATE THE POPULATION TO COME TO KNOW THE NEW BANKNOTES BETTER

In January 2018, Goznak presented “Banknotes 2018” mobile application facilitating preliminary authentication of banknotes of the Bank of Russia with the face values 200 and 2000 roubles as well as providing users with an opportunity to come to know the sets of their security features. According to the developers, the new product is not an alternative to the traditional authentication methods. The task of the new application is to make the process of examination of the new banknotes easier and more convenient.

The application has been developed by the specialists of Goznak. The details of the development are withheld, however, as the General Director of Goznak Arkady Trachuk noted at the presentation of the new product, the application is based upon the same principle as programs for face recognition:
“The application principle is in a way comparable to the way a face recognition program recognizes a human face. In the application, there is a generic template made on the basis of an authentic banknote at several angles. Then the application analyzes the presented banknote at these angles and records the coincidences. With a certain number of coincidences, the system asserts the existence of security features on the banknote”.
“By developing “Banknotes 2017” mobile application, Goznak has confirmed entering

digital economics”, Chairman of the Board of Directors of Goznak, Deputy Minister of Finance Alexey Moiseev is sure. “Now everybody may use his smartphone to scan a banknote and make sure it is authentic”.

HOW TO CHECK A BANKNOTE

The banknote authentication takes place with the help of a smartphone camera. To start the authentication, it is necessary to direct the camera of the mobile phone at the banknote, and after that, the application will determine its face value and side (front or back). Moreover, a corresponding animated picture appears on the smartphone screen with the help of the augmented reality technology: for example, on the front side of the 2000-rouble banknote, there appears a 3D image of a rocket on the launching cradle of Vostochniy cosmodrome, and stylized images of the planets of the solar system circling around it. After determining the face value and the side, the main authentication stage starts: when directing the camera at the banknote, it is necessary to align the banknote edges and the frame on the screen. If they are aligned correctly, the banknote corners become green and the telephone vibrates. Then it is necessary to align the banknote to the frame again, at a different angle. In case authentication is successful, there will appear a green inscription, “Security features have been detected”, on the screen. If authentication is not successful, it is possible to repeat the operation by pressing a button in the top right corner of the screen. The application also contains general information about banknotes, their design and technical characteristics.

A SMARTPHONE INSTEAD OF A MAGNIFYING GLASS

“Banknotes 2017” application should make the new face values of the banknotes more user-friendly. Its aim is to help the population to get used to the new banknotes.
“The new mobile application is intended to instill a sense of confidence to those citizens who come across the new banknotes for the first time”, Arkady Trachuk explained. “The information about authentication methods and, most importantly, an opportunity to detect certain features with the help of a smartphone will be extremely useful”.
Arkady Trachuk emphasized that Goznak did not aim to fight against counterfeiting by creating the application:
“In Russia, the share of counterfeits among the banknotes in circulation is very low; it is lower than in the European Union for some of the face values. Therefore, the mission of the application is not so much protection against counterfeiting, as better acquaintance with the banknotes, awareness-building, giving confidence. If we carried around a tenfold magnifying glass with us always, it would be reasonable to explain how to authenticate a banknote with the help of such a magnifying glass. And one would not require a smartphone for that. However, we have smartphones in our pockets. Therefore Goznak offers a convenient tool for preliminary authentication of banknotes with the means available”.
According to the General Director of Goznak, the application is certainly not able to check all the security features applied in a banknote:
“It cannot replace all authentication control systems existing in ATMs, specialized devices and counting and sorting machines. Working upon the application, we did not aim that. The application is only an auxiliary tool for employees of trading and service establishments, because in the majority of cases they apply more complicated banknote authentication devices.
Arkady Trachuk said that with all the perfect technologies, banknote authentication using only a smartphone camera is quite dependent on the light conditions and a number of other factors. At the same time, the experience of testing the application showed its reliable work as an assistant for a person not well acquainted with the new banknotes.
According to Arkady Trachuk, the National Bank of the Netherlands has been the only one who presented a similar application for detecting separate security elements with the help of a smartphone camera (for euro banknotes) only to wide public before Goznak. Moreover, Goznak applied a principally new technological solution and other algorithms of information processing for detecting security elements.
“Banknotes 2017” application is free of charge. There are two versions – in Russian and in English. It is available at Google Play for Android-based telephones, and at AppStore for iOS.

HIGH-TECH SOLUTIONS

In recent years, Goznak is expanding its presence in the market of IT services. Data processing centers have been launched at Goznak’s technological basis. “Banknotes 2017” application has become one of important projects.
By the way, in spite of the fact that the banknotes are new, the application has been “taught” to read security features on worn, almost dilapidated banknotes too.
“Of course, we haven’t had a real opportunity to test such banknotes by withdrawing them from circulation”, Arkady Trachuk explained. “Therefore we carried out the tests using artificially aged banknotes. Taking these tests into account, we improved the application so that it operated reliably with all banknotes in circulation”.
As for developing similar applications for other previously issued face values of the banknotes, the main problem here is connected with the fact that “old” banknotes were developed at different times, and their security feature architecture is not designed for using smartphones for authentication. For example, some security features located on one side of the new banknotes, are located on different sides on the previously issued banknotes.
Speaking about applications for the rest of the banknote face values, Arkady Trachuk noted:
“So far, we have certain doubts that we will manage to choose a necessary algorithm for all the circulation banknotes because the banknotes differ from each other, and some of them were developed at the times when there were no smartphones. Nevertheless, we will continue such work, and if as a result we will manage reliable authentication of security features, we will issue an application for authenticating the previously issued face values of banknotes. And certainly, in the future, when new or modernized banknotes are issued, Goznak will offer mobile applications for their authentication simultaneously”.
According to the Chairman of the Board of Directors of Goznak, Deputy Minister of Finance of Russia Alexey Moiseev, in Russia there is a tendency to provide the citizens with an opportunity to authenticate the purchased goods personally. In particular, there is an application for authenticating alcohol by checking the excise stamp; the citizens can also authenticate the compulsory third party car insurance policy by checking its number.
“The number of such examples grows. It is planned to implement such products for other goods too. For example, medicines and jewelry. The development of a mobile application for authenticating banknotes is in the same trend”, Alexey Moiseev is sure.
In 2018, Goznak is celebrating its 200th anniversary, and according to Alexey Moiseev, Goznak has entered the jubilee year as a dynamically developing company with a broad spectrum of opportunities in various fields.

Authenticating with the help of a smartphone

THE AUTHENTICATION SYSTEM DEVELOPED AT GOZNAK INCLUDES THREE MAIN COMPONENTS: AN IDENTIFICATION STAMP, A DATABASE AND A SMARTPHONE

How does one authenticate printed products within the Track&Trace system? Developing solutions for the brand authentication and security is a major target for Goznak. Head of Department of Printed Security Solutions of the Research Institute – Branch of Goznak Egor Kazantsev described the plans in detail to “The Formula of Security”.

Special federal and excise stamps for alcohol and tobacco products, as well as control identification tags with RFID marks for fur goods, are examples of successfully realized ventures, in which Goznak not only was an exclusive manufacturer of security printed products, but also took an active part in developing the authentication system. In addition, the specialists of Goznak developed and implemented the first in Russia high-tech integrated system of control and authentication of licensed souvenir products for the Olympic Games in Sochi and the Universiade in Kazan.

Solutions for the brand identification and security

1. Federal special and excise stamps (alcohol and tobacco products)
2. Brand security (Universiade in Kazan 2013, the Winter Olympic Games in Sochi 2014)
3. Control identification tags with RFID-marks

AUTHENTICATION CONTROL OF EXCISE STAMPS FOR ALCOHOL PRODUCTS

The Unitary State Automated Information System has been functioning on the alcohol beverage market in the Russian Federation since 2005. Its purpose is computation of the production volumes and turnover of ethyl alcohol and alcohol-containing products. The Unitary State Automated Information System encompasses the manufacturers of alcohol, as well as wholesale and retail sellers of alcohol-containing products. Critics of the system point out the fact that there is no authentication control of excise stamps during the sale of alcohol in retail stores. Therefore, it is impossible to fully control the “manufacturer – wholesale – retail – buyer” chain.
Involving consumers (general population) in the process of authentication may be a solution, which, on one hand, would boost consumer confidence in the purchased product’s authenticity, and, on the other hand, would provide the brand owner with hundreds of thousands of so-called “authentication volunteers” (in the form of consumers). Modern and universal communication means for authentication need to be employed for general population to be able to use such a system.
An important aspect of the attained solution is releasing the system’s customers from financial contribution for creating the system.

Excised product circulation control systems

EGAIS (the Unitary State Automated Information System) – a system of accounting the volumes of production and turnover of ethyl alcohol and alcohol-containing products – has been operating in Russia since 2005.

EGAIS embraces alcohol manufacturers, wholesale and retail sellers.

THE WAY THE AUTHENTICATION SYSTEM WORKS

The developed authentication system includes three main components – an identification stamp, a database and a smartphone.
A verification code consisting of a random set of letters and numbers is applied to the identification stamp. During the printing process, the stamp is personalized with a 2D barcode containing the stamp’s unique identification number. After printing, the identification stamp is delivered to the automated vision unit where the barcode on the stamp and the corresponding verification code on foil or thread are read. The information is transmitted to and recorded in the server’s database using “online” mode. The user reads the barcode with the help of an application installed on his mobile device. The application sends a request to the server, “What verification code corresponds to the stamp’s identification number?” and receives a proper response. The verification code is displayed in the application on the screen of the mobile device, and the user has an opportunity to validate the existence and conformity of the verification code on the identification stamp.
The authentication system and alternative methods of its implementation are patented by Goznak.

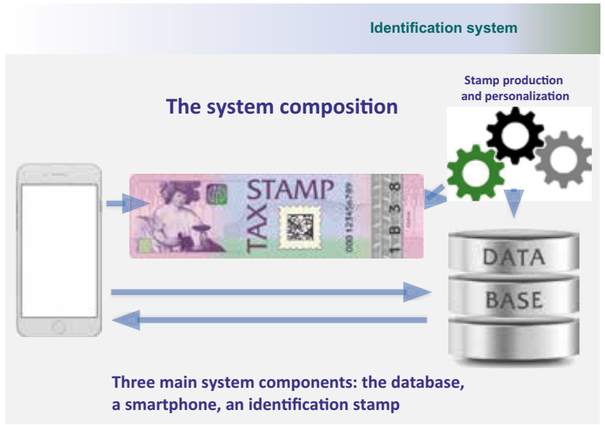
IDENTIFICATION STAMP PERSONALIZATION

The identification stamp is personalized with a 2D barcode applied with the help of inkjet printing that contains data about the product and its manufacturer. The stamp’s set of security features includes paper with security thread or holographic foil, whereas the verification code is applied using the de-metallization method. Security thread has a small windowlike exterior opening, and the verification code is located on the thread in such a way that it is visible on the thread emerging on the paper surface. The developed automated vision system that is capable to read the 2D barcode and the verification code subsequently creating a database, is the key

A new solution for identification

The main ideas of the new system

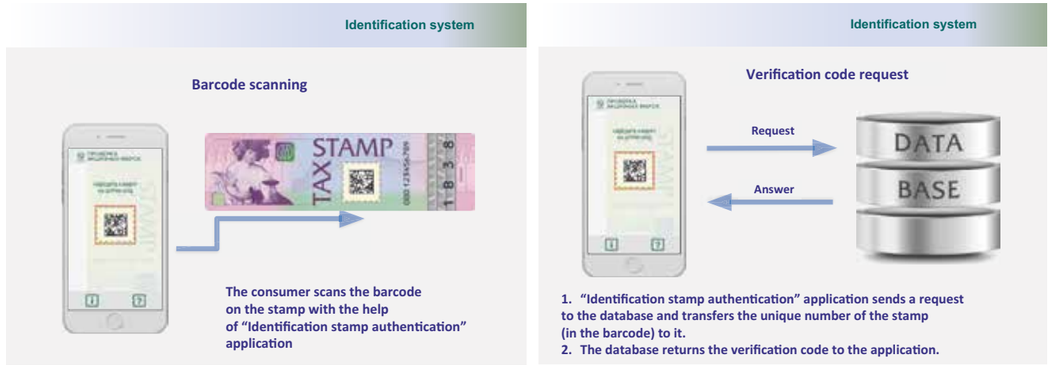
1. **To make stamps not only a tool for tax collecting, but also a product authentication instrument**
2. **To involve the consumers (population) into the product authentication process, to give the consumer confidence in the product’s authenticity**
3. **To apply modern and available communication means for authentication**
4. **To release the customers from capital investments into the system construction**

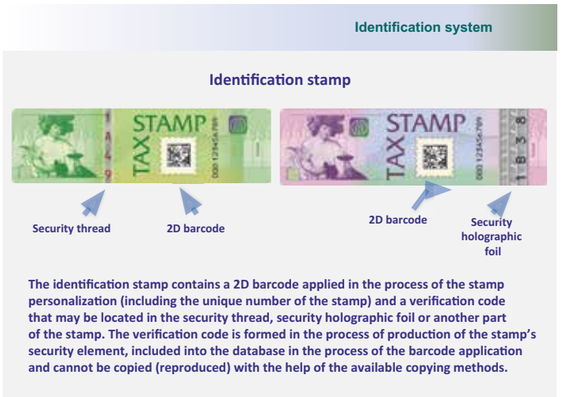


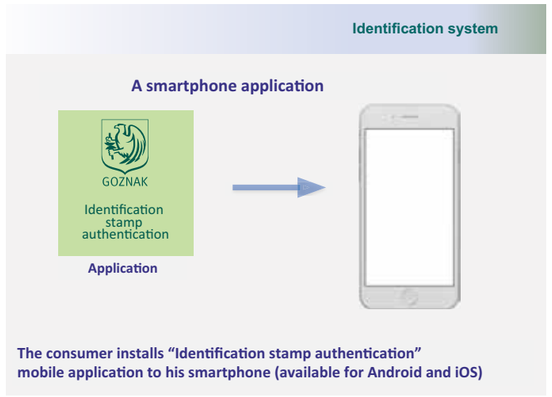
component in identification stamps production. The automated vision system was integrated into the existing production line without significant changes to the current process of product personalization, while preserving current production process.
Within the framework of scientific research and modification of methods of automated vision for the verification code control, the dilemma of selecting the optimal number of symbols of the verification code (3 – 4 symbols) was resolved. Symbols with similar tracing were excluded and the optimal garnish font and its size were determined.
An effective solution was found with the purpose of excluding possible specks of metallized thread or foil, as well as achieving maximum image contrast: the security thread and the foil were primed with infrared transparent ink, helping to achieve a high visual contrast of the verification code in the visible light, at the same time receiving a sharp image of the de-metallization symbols in the infrared range.
Similarly, the application of IR backlight allows to obtain maximum possible image contrast of the 2D code due to its application inks not being transparent in the IR range, unlike the background pattern inks located around the code.
In the transmitted light, backlight from the reverse side is used for the control of symbols applied using the de-metallization method, and angled backlight from the front enables reading the 2D code. Using a bandpass infrared filter on the video camera, we managed to minimize the external influence (e.g., specks from exterior light sources).

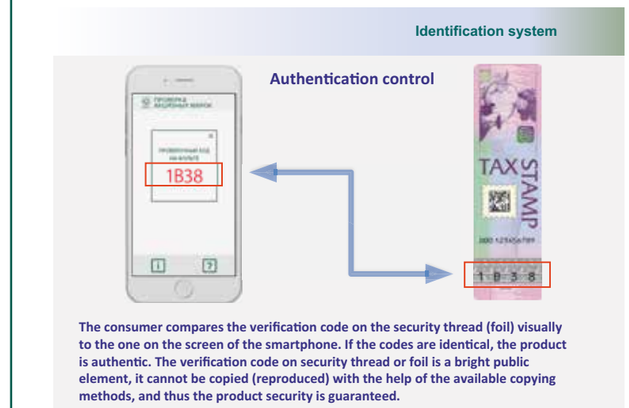
AUTHENTICATION WITH A SMARTPHONE

To use a smartphone for authentication, its user should install the Identification Stamp Control mobile application. During the installation, the application will request access to the smartphone camera. Access to Internet is also required for the application's operation. Currently, the application is available for smartphones and iPads powered by Android, while application for iOS is expected to be rolled out shortly.
The consumer scans the 2D barcode on the stamp with the help of the Identification Stamp Control application. He simply needs to focus the camera screen's red square area on the 2D barcode. The barcode is read automatically, and the application determines the unique serial number of the stamp.
The application communicates with the server, transmitting the serial number. Additionally, the number of requests with this serial number and their approximate location are stored in the database. Consumer's location is determined with the help of the IP address from which the request was sent.
When modifying mobile application to the customers' demands, it is possible to transfer smartphone users' information, as well as their precise location, via GPS (provided, of course, the users' consent to the data transfer during the application installation). The server's database has management interface that allows remote editing of its contents, obtaining analytical information about communications with database, viewing the map of the requests etc. The server of the mobile application compares the received serial number of the stamp and the verification code to the database and returns the verification code to the mobile application.
The consumer visually compares the verification code on security thread or foil to the code appearing on the smartphone. If the codes are identical, the product is considered authentic.
The verification code on security thread or foil is a prominent public feature and cannot be reproduced using the accessible copying methods. Thus, the product's authenticity is guaranteed.









The main advantages of the new authentication system:

1. ***The system permits to store information about the issued stamps and those in circulation, as well as reliably authenticate based on public features and system information.***
2. ***The system of marking and authentication may be implemented at the customer's location, eliminating major financial costs.***
3. ***The customer may be offered the entire system, as well as its individual components, i.e. identification stamps, software or data storage.***

Durable and Secured

GOZNAK INTRODUCED A NEW CONCEPT OF A DURABLE BANKNOTE USING A PROMOTIONAL BANKNOTE PRINTED ON THE PLASTIC SUBSTRATE

Traditionally, tough requirements for anti-counterfeiting security, as well as equally tough requirements for durability, are imposed on banknotes. Foremost, these requirements apply to banknotes with low face value. The banknote durability greatly depends on the properties of the substrate the banknote is printed on.
There was a time when banknotes were printed exclusively on paper. At the end of the 20th century, the monopoly of banknote paper has ended – some countries began using plastic substrate in banknotes production. Compared with paper, plastic possesses much higher durability and resistance to soiling. However, continuous use of banknotes on plastic substrate also revealed disadvantages associated with limited opportunities of using many security features, especially those used in the paper substrate.
A new solution developed by the specialists of Goznak makes it possible to combine the banknote's high durability and its top-notch security in one product. Goznak demonstrated this solution in its promotional banknote dedicated to the Russian natural environment and timed with the Year of Ecology in Russia.
According to Deputy General Director of Science and Development of Goznak Andrey Kuryatnikov, the new solution for banknotes includes:

- Application of durable plastic substrate
- Use of traditional banknote printing equipment, i.e. a set of pre-printing, printing and post-printing equipment available with the banknote manufacturers
- Application of technology that increases durability equivalent to the durability of the substrate itself, compared to the existing plastic and hybrid substrates (i.e. application of inks, printing methods, as well as post-printing processing providing reliable curing of inks on the substrate and their durability equivalent to that of the substrate during the cash circulation)
- Use of new visually variable security features similar in perception to traditional ones (like watermarks, security thread, KIPP-effect) yet with easy-to-perceive visual variable properties
- Reduction of costs for the banknote production on the new substrate, compared to other high durability substrates
- A possibility of "scaling" up to a banknote with the high face value as a result of application of high-security holographic images and visually variable elements, e.g. SPARK and holograms.

Implementation of modern technologies and improvement of the products' quality according to demands of time enable Goznak to expand the distribution area, provide continuous top-notch quality of products and increase its competitive ability in the international market as well. Traditionally, Goznak demonstrates its new developments on the promotional banknotes. On its promotional banknote issued in 2017 the company introduced not just new security features, but a new concept of a durable banknote altogether.

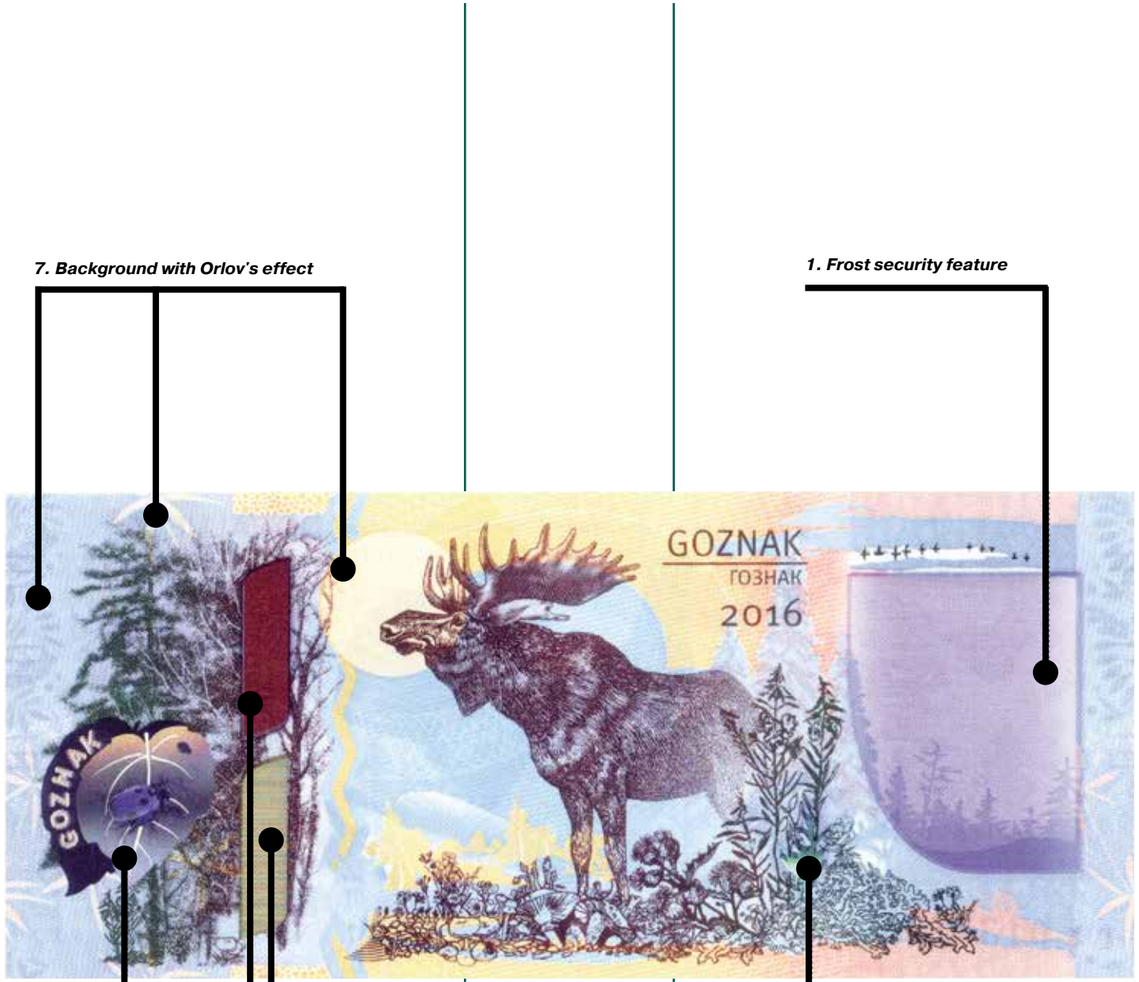
Andrey Kuryatnikov also noted that efficient public security features are integrated into the banknote design:

- A transparent toned area resembling a watermark, containing a visually variable security element observed in transmitted light on any side of the banknote and changing a positive image to a negative one with the change of the angle of slope as well as a kinetic feature
- Two shaped windows imitating thread and containing color shifting security elements controlled in transmitted light on any side with the change of the angle of slope
- A hologram with a kinetic effect, a visually variable background, a 3D element, and machine-readable area
- SPARK security element with the rolling bar effect, located on the reverse of the banknote, controlled on both sides of the banknote
- Tactile elements located in the right-hand side on the reverse.

In addition, traditional security features of cash and expert levels are applied to the banknote:

- Graphic security elements. i.e. guilloche elements and special rasters
- Traditional elements with 2D Iris effect, microtexts, UV luminescence with IR absorption.

Machine-readable features for counting and sorting machines and banknote receiving devices are also applied to the banknote.



7. Background with Orlov's effect

1. Frost security feature

2. MSCI–Multi Colour Shift Image

3. Zebra security feature

4. Hot stamping foil with high-technology security effects

5. SPARK security feature

8. Background with 2D-Iris security feature

1. Frost security feature

3. Zebra security feature

5. SPARK security feature

2. MSCi – Multi Colour Shift Image

4. Hot stamping foil with high-technology security effects

6. Gibbose tactile elements

1. Frost security feature

Pic. 1a

Pic. 1b

Optically variable slightly coloured security feature of big square looking like a watermark is identified in transmitted light on both sides of the banknote. While tilting the banknote the image changes from positive to negative (Pic. la, lb).

The security feature may be of different shape, graphics and colour that provides unlimited opportunities of its integrating into the banknote design.

Pic. 2a

2. MSCI – multi colour shift image

MSCI optically variable security feature looks like security thread window on the paper surface and is controlled in transmitted light on both sides of the banknote. Coloured zones changing their colour while tilting the banknote are seen very well in transmitted light (Pic. 2a, 3a, 3b). In the meantime, the same location of coloured zones and their colour is provided technologically on all banknotes. The security feature has homogeneous background in reflected light.

MSCI security feature has a wide range of opportunities to be integrated into the banknote design and may be produced in different 2-colour or 3-colour performance.

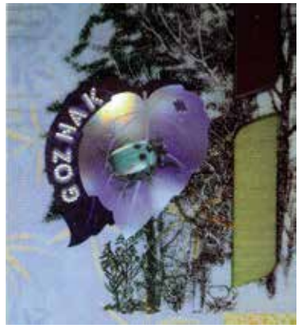
Pic. 3a

Pic. 3b

3. Zebra security feature

Optically variable coloured security feature made in contrast colours looking like security thread window on the paper surface is identified in transmitted light on both sides of the banknote. While tilting the banknote the image changes from positive to negative (Pic. 3a, 3b). Zebra Mobile performance version may have kinetic effect: while tilting the banknote it is seen the movement of repeated stripes, rectangulars and other geometric figures.
The security feature may be of different form, graphics and colour that provides great opportunities for integration this feature into the banknote design.

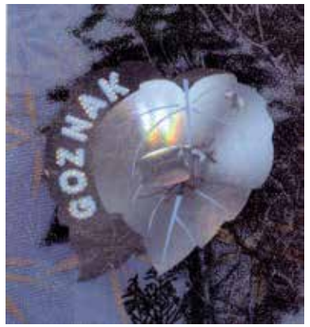
Pic. 4a



Pic. 4b

Pic. 4c

Pic. 4d



Pic. 4e

Pic. 4f

Pic. 4g

4. Hot stamping foil with high-technology security effects

Locally laminated security holographic foil of leaf shape demonstrates:

- impressive Mobile kinetic effect – while tilting the banknote the letters of GOZNAK word move relative to each other (Pic. 4a, 4b);
- 3D effect – prominent monochrome 3D image of a beetle and a dew drop on a leaf (Pic. 4c);
- Coloured Latent Image – while examining the banknote under the certain angle a coloured image of a red ladybird on a green leaf appears instead of 3D element and Mobile security feature (Pic. 4d);
- SmartGlint effect – an image of W letter visualized with a point source (for example, with smartphone LED lamp) and sliding on the surface of the holographic image following to the point source movement (Pic. 4e);
- machine readable latent code identified with special device or detector;
- an opportunity to identify a part of security effects on the reverse side of the banknote through transparent window;
- optical 3D elements with double-sided effect (Pic.4f.4g).

Pic. 5a

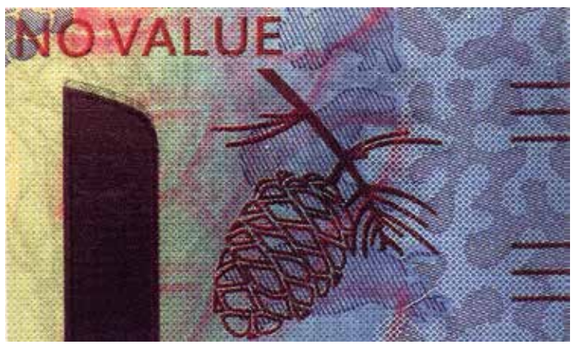
Pic. 5b

Pic. 5c

Pic. 5d

5. Double-sided spark security feature

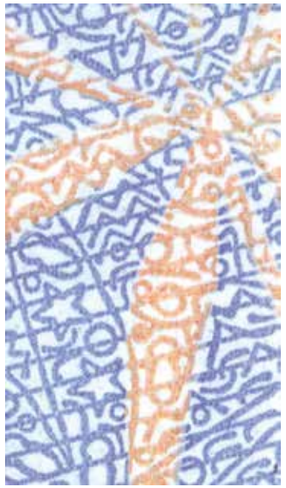
Optically variable security feature with kinetic effect made of OVMI ink is controlled on both sides of the banknote due to printing in transparent window (Pic. 5a, 5b, 5c, 5d).



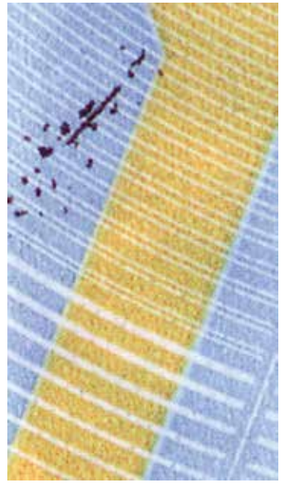
Pic. 6a

6. Gibbose tactile elements

“NO VALUE” writing, cone image and gibbose marks made as streaks for blind and visually impaired on the reverse side of the banknote are identified by hand feel very well (Pic. 6a).



Pic. 7a



Pic. 7b

7. Background with Orlov's effect

Orlov's effect on the obverse part of the banknote seen at the frontier of two colours as transition of one colour to another without lines breaks, overlappings or displacements is realized using standard SuperSimultan IV machine. Widely usable in intaglio printing Orlov's effect improves the banknotes security not only against the counterfeits on digital equipment, but also against copying by poligraphic method.Orlov's effect application in offset printing on polymer substrates is a unique solution that, like in intaglio printing, safely protects the banknote from imitations with other printing methods (Pic. 7a, 7b).

Pic. 8a

Pic. 8b

8. Background with 2D-Iris security feature

The next step of Orlov's printing is realized in Goznak in 2D-Iris effect by using specially developed section of SuperSimultan IV machine. Background with 2D-Iris security feature can not be reproduced with copy machines and standard polygraphic equipment and has both sharp edges and smooth transitions from one colour to another in all directions (360 degrees) without using screening technology. This feature is made in process of offset printing and provides high level of banknotes security without additional runs (Pic. 8a, 8b).

Elena KISELEVA

Cash and the World

THE GROWTH OF CASHLESS PAYMENTS IN RUSSIA IS REMARKABLE, EXCEEDING FORECASTS MADE 5–7 YEARS AGO

Director of the Research Institute of Goznak Georgy Kornilov told The Formula of Security about the global tendencies of cash circulation, tough competition of banknote manufacturers and the role of Goznak in these fast-paced conditions.

– How does the connection of cash and non-cash money change in the world over time?

– The global tendencies in the cash circulation field have remained unchanged for the last 15 years. The share of cash payments in the total number of payments in the world gradually decreases.

There are countries where the share of cash payments by now comprises 10%. First and foremost, those are the Scandinavian countries – Sweden, Norway, Denmark and Iceland.

In most countries, cash payments still make up the majority of payment transactions, considering the overall number of operations. Globally, there are countries where people prefer cash, and 90% of payments are carried out as such. Again, there is no direct correlation between the country's development progress and the level of cash and cashless circulation. However, the number of non-cash payments is considerably higher than average in the technologically developed countries.

Nevertheless, in the overwhelming number of countries, the growth of share of non-cash payments does not affect the number of banknotes in circulation. In spite of the fact that the share of cash payments decreases, the amount of cash in the economy remains on the same level and even demonstrates a certain growth, at the inflation level, for example, about 5% a year.

Globally, there are only a few countries where the volume of cash actually decreases. A distinctive example of this tendency is Great Britain, where an obvious decrease of cash in circulation is observed.

RUSSIA WITHIN THE FRAMEWORK OF THE GLOBAL TENDENCY

– What happens to the share of cash in Russia?

– Overall, Russia is positioned within the framework of the international tendency of cash circulation. Over the latest decade, the volume of non-cash operations carried out with the help of various payment instruments in retail trade has grown from a few percent (about 3%) in 2008 up to over 30% in 2016.

We have collected data on the first half of year 2017. Based on that data, the share of non-cash payments will grow up to 35% during the rest of the year. The growth of non-cash payments in Russia is tremendous, exceeding all possible predictions made 5–7 years ago. In this regard, Russia is an amazing country, with the number of banknotes in circulation remaining at the same level during the decade of an uninterrupted explosive growth of non-cash payments.

In 2006, there were about 6 billion roubles in circulation in Russia. With slight fluctuations, the number had been preserved for ten years and remains unchanged today. I would like to point out that we are talking about the actual number of banknotes. If we speak in terms of money, then an obvious monetary expansion

is observed. It indicates that people are starting to use banknotes with higher face values. Being obvious, this tendency does not need any proof.
Accordingly, there were no banknotes in circulation with the face value of 5000 roubles in 2008, as there were 10-rouble ones. Consequently, the 5000-rouble banknote emerged and turned into the most popular one among the Russians today – the greatest number of banknotes in circulation now is accounted for the face value of 5000 roubles.

THE NUMBER OF BANKNOTES PER CAPITA

– There is another interesting ratio connected with the number of banknotes per capita. In terms of this ratio, Russia comes midpoint in global rating – there are about 45–50 banknotes per capita in our country.
This ratio is not linked to the sufficiency level of the population nor with the infrastructure development. For example, Japan is a country with the highest number of banknotes per capita. However, the non-cash payment infrastructure in the country is developed exceptionally well. The Japanese simply love their banknotes. Similarly, India and China have a high (75–80) number of banknotes per capita. There are other seemingly perplexing examples. For instance, there are 23 banknotes per capita in Turkey, a country considered by many to be at the lower levels of economic development. Thus, the number of banknotes per capita does not link to the level of the country's economic development.
According to this rule, the number of banknotes in circulation is divided by the number of population, and yet the result does not mean that the individuals have exactly this number of banknotes in their possession. However, there are additional researches dedicated to ascertaining the number of banknotes the population retains, and their face values. Without a doubt, during the upcoming decade the banknotes will remain in our everyday life. However, it is difficult to say how the existence of banknotes will change subsequently.

CROSSING AND AFFIXING

– Are the bank applications projected to be affixed to ID documents?
– Technologically, we can certainly do that. However, it is unlikely that an ID document will be completely affixed to a payment document. When speaking about the international ID documents, passports or any other form of internationally accepted identification documents, they have their own resolute function connected with personal identification. Moreover, identification should happen by both physical contact with an inspecting officer and within the framework of a currently emerging tendency, by identification in some sort of electronic environment. In this case, a document of this kind does not serve as a bank application.
Additionally, internal documents, including those in other countries, have a function of identifying a person in both the physical and virtual environment. A person can receive certain services via this identification – obtain state services remotely, open a bank account, request monetary transactions. However, the document does not carry the payment function directly, but only as a substitute. For example, if one establishes his identity with such a document, he can view his account and carry out certain functions. However, payment functions are not the key for an identification document. There is a vast number of financial technologies in which identification is important, but which are by no means a part of the identification document. It is likely that the development of these two kinds of ID documents will take place simultaneously in the future. When we speak about a modern identification document, we assume it is a sort of an accruing document that collects information or provides access to information about a person from different areas, i.e. revenue service, social insurance system, medical services system etc. In this manner, we can say that there will be an integrated identification of a person in various states of financial services. However, a complete affixing of identification and payment documents in the future is quite unlikely.
– Can new and fundamentally different payment systems emerge in the future?
– It is difficult to speak now about creating new payment systems. However, a tendency of expanding the existent payment systems is obvious. A process of affixing payment systems with retail is also underway. Retail networks and internet shops strive to create their own payment system. We can see the prototype already – Amazon's very own payment system. In this situation, a person does not need to leave the "ecosystem of a retail seller" at all – he can buy everything he needs and keep his money in the system. Goznak has not started creating such payment ecosystems yet, but that does not eliminate our interest in this matter in the future.

MARKET OF TOUGH COMPETITION

– How do the banknote manufacturers feel in the environment of indefinite future for cash?
– A decrease of the share of cash in circulation does not influence the banknote manufacturers directly. At least, it has not so far. The number of banknotes in circulation is important for the banknote manufacturers, and it remains stable for now. Moreover, this number gradually grows, although not as fast as it did a few years ago.
The problem for the banknote manufacturers is the fact that the banknote production market has become more competitive than ever.
First, the equipment performs on a much higher level. The modern machines produce banknotes at a much higher speed than 10 or 15 years ago. The equipment has become much easier to operate. Previously, the banknote production was a meticulous art. Now it is an industrial science by far. In addition, it is no longer difficult to train a dozen of engineers who would be able to work with the supplied equipment. Even those countries that could not afford banknote equipment before, can certainly afford it now.
The recent launch of numerous banknote production sites is another reason for stiffer competition in the market. Additionally, new operations are being put in production. The world is facing excess capacity, applying pressure to the global prices for the banknote production. Moreover, looking at the tendency of the global prices for banknotes, it becomes obvious that the prices have decreased during the recent years under the pressure of competition.
The situation with the banknote paper production is a bit different. The banknote paper is produced in massive, industrial-scale volumes. It is not profitable to produce paper for 10, 20 and even 300 million banknotes. Moreover, nobody would build a separate mill and produce paper even for one billion banknotes. Nevertheless, for decades, there have been three countries leading banknote paper consumption: Nigeria, with no domestic banknote production site, India and Indonesia. All three countries considered initiating domestic banknote paper production. India took it a step further and has already created its individual paper production that satisfies a large portion of its paper needs. This change influences the global paper market as well.

The banknote production field has been changing dynamically in recent years. New companies producing banknotes emerge, while former companies close. European banknote production sites are going out of business, e.g. Dutch and Belgium production sites have been closed. In Denmark, the possibility of the country producing its own individual banknotes is being discussed. Similar discussions are held in several other European countries, although proposing the location of banknote production sites in Asia and Africa. One of these large projects had been carried out in the United Arab Emirates. The country created its own considerable banknote production site. The site is too great for fulfilling the country's individual demand alone. Seemingly, the United Arab Emirates count on supplying banknotes to the neighboring countries.

Today, Goznak is one of the five global leaders in banknote production. Of course, the Bank of Russia is the largest and most important customer of the enterprise. However, the export today is an essential part of our company's revenue. Moreover, working in a highly competitive environment enables Goznak to develop and observe the global tendencies, as well as compete with the best companies in the business and enable further development. The international market is a factor that boosts our company's efforts towards self-improvement.

FUNDAMENTAL CHANGES

– How do the interests of the Research Institute and the topics of the scientific researches change due to the change of the situation in the cash market?

– When the Institute was founded in 1948, all work that was carried out related to the production of banknotes and coins. For a time, a department connected with diamond processing existed as well.

Overall, the activity of the employees of the Research Institute related to industrial science – the Institute was engaged in developing the equipment for the banknote paper, printing and ink production. Here, papermaking, printing and ink production technologies were being developed. There existed an entire department of designers creating the equipment.

Fundamental changes in the activity of the Research Institute took place in the first half of the 1980s. The focus shifted to developing security features for banknotes.

By the 1990s, most of the work was aimed at developing and improving technological systems connected with the banknote security.

Today, the Research Institute is facing yet another shift in its activity focus. Since the beginning of the 2000s, The Institute researches revealed the subject of plastic- both plastic-based documents and their testing characteristics.

Work connected with electronic data carriers' documents is becoming a new important aspect, and the number of efforts connected with information technology is increasing. This includes documents with the electronic data carriers, digital identification, as well as certain software. The shift of Goznak's focus to this activity field has lately become obvious.

– Does the Research Institute take into account the cryptocurrencies in its works?

– There have been a few studies on the types of modern payment, including electronic payments and bitcoins among them, here at the Research Institute. However, in the modern framework of Goznak's activity, bitcoins and other cryptocurrencies are not the target. It is not likely that Goznak will start mining cryptocurrencies, but it is quite possible to assume that the company will develop some sort of solution based on the blockchain technologies.

Cash is still real

The speech of Nena Vukicevic, Managing Director of Europe and Africa, Currency Research, at the Seventh International Conference on Security Technologies and Solutions Watermark 2017 (July 2017, Yekaterinburg), was dedicated to the perspectives of cash payments in the modern society:

– The analysis carried out by Currency Research, showed that there were approximately 484 billion banknotes in circulation. To satisfy the demand of the market, about 170 billion banknotes per year are required. The volume of the world coin turnover registered by the Bank for International Settlements (BIS) has grown from 846 billion in up to over 1 trillion by the end of 2015. The global demand for coins continues to grow; it is evaluated at over 60 billion US dollars per year.

Cash money in circulation continues to grow. It is observed in the markets of Great Britain, USA, Canada and Australia.

What are the main factors influencing the growth or decrease of cash usage? They are the demand for transactions, demand for currency like dollars, euros, pounds sterling and some others, private savings and hidden economy.

How do the commercial banks react? Besides providing investments into new projects and safety measures to prevent attacks at banknotes, many banks have started rationalization, decreasing the general structure, but they still provide automation of cash processing.

The first fully automated cash settlement center in France was opened not far from Lille in April 2016; its price (plot of land, buildings and equipment) comprised 40 million euros. Its peculiarities are fully automated high-speed material processing, with the capacity of 300 million processed banknotes per year.

The second fully automated cash settlement center of the Bank of France is to be launched in the spring of 2018 (it is located to the north of Paris). Its building was started in June 2016, priced at 95 million euros. It will be equipped with high-speed processing machines, full automation and the capacity of 1.5 billion banknotes per year.

The first fully automated cash settlement center in Germany supervised by the German Federal Bank is to be opened in the second quarter of 2019, priced at 300 million euros.

Another significant topic is cybersecurity. According to the report of Nilson Company, 21.84 billion US dollars were stolen in the world in 2015 as a result of frauds with payment cards, and this figure increases steadily.

Gemalto Company engaged in informational and digital security has published the results of 2016. They claim that data leakage of electronic payments has grown by over 50% to compare to the previous year. 974 irregularities were detected during the first half of 2016; that resulted in 554 million of electronic data records being impaired all over the world.

Segments exposed the most to cyberattacks are the retail and financial sector. Over 75% of targeted attacks were carried out against them in 2015. In 2016, cybercriminals attacked the personal data, but they also concentrated on the governing and technological fields.

The latest data of the research carried out by Juniper company testify that the number of attached devices, sensors and mechanisms of management will exceed 46 billion in 2021, which is 200% more than in 2016. Trying to enter the market sooner and earn a profit on implementing new technologies, the companies sacrifice security and create programs with an open initial code of components.

Some companies count on increasing profits with the help of implementing a payment system in the plug-in devices like refrigerators, home smart devices, car accessories etc. The recent partnership relations between Visa and IBM show that IoT Big Blue Watson platform will have access to Visa payment services via tokenization of offers for 6 thousand client companies with the help of POS-terminals.

Slavyana **RUMYANTSEVA**

Not Just Paper

WITHOUT THE PRODUCTS OF THE PAPER MILLS OF GOZNAK, THERE WOULD BE NO BANKNOTES, STAMPS OR GEOGRAPHICAL MAPS.

The Saint Petersburg Paper Mill operates in the same group of buildings where Goznak's history began with the foundation of the Expedition of Storing State Papers in 1818. «The mill is unique because for 200 years it employed excellent specialists and high-skilled craftsmen», ascertains Deputy Director of Production of the Saint Petersburg Paper Mill Alexandr Pyanykh. «Our competitive advantage is the combination of Goznak's traditions and industrial application of cutting-edge technology, improvement of the existing technological processes and efficient resource management. This enables us to master new types of products and broaden the area of service, including security papers».
The same can be said about the work of the Krasnokamsk Paper Mill that celebrated its 80th anniversary in December 2017.

UNDER THE RELIABLE PAPER PROTECTION

During the last five years, the Saint Petersburg Paper Mill mastered the production of more than 40 new types of paper with amplified security. The products are intended to manufacture banknotes, security papers and various types of documents.
According to Director of the Saint Petersburg Paper Mill – Branch of Goznak Vitaly Artemov, paper for the commemorative banknote dedicated to the Olympic Winter Games «Sochi 2014» takes up a special place among the new types of products. For the first time, a broad polymer band

There are hundreds of various paper types at the Paper Mills of Goznak in Saint Petersburg and Krasnokamsk. First, they are security papers used to produce banknotes, special and excise stamps, securities, as well as several types of documents. Additionally, there are a lot of types of paper for practical use, i.e. drawing, painting, cartographic, diagram, chalk-coated, gummed, paper base for fliselin wallpaper etc. Products of these paper mills have been distinguished at various Russian and International competitions.

was introduced into the paper, allowing to create a transparent window in the banknote. The window was required for a new security feature called «Zebra». Additionally, for the first time, security fibers were embedded in serial products using the stripe method. Besides, in 2014 «Zebra» security feature located in the transparent window on «Sochi 2014» banknote was the winner of the Excellence in Currency Award prestigious competition (for special success in the cash circulation field) in the category «Best New Security Feature».
New security elements were also mastered during the production of paper for another commemorative banknote dedicated to the integration of the Republic of Crimea and the City of Sevastopol into the Russian Federation. The watermark was made with the help of an innovative technology and represented a combination of a halftone watermark and a multi-level filigree. Micro-metallization in the shape of the symbol of the Russian rouble was applied on the security thread, and a new security feature was embedded using the stripe method.
The technology for self-adhesive paper manufactured for the control identification marks for fur goods production was mastered at the Saint Petersburg Paper Mill in 2016. The set of security features used in the control identification marks is difficult to reproduce and easy to identify.
«Almost all Russian businesses licensed for the production of security printed products are the clients of the Saint Petersburg Paper Mill. For them, we produce special types of paper with various kinds of security– with watermarks, special fibers, metallized threads, elements of chemical and other types of security», assets Head of Sales and Logistics Division of the Saint Petersburg Paper Mill Alexey Filippov. «The paper is used to produce accounting forms, lottery tickets, certificates etc.»
The products of Goznak's paper mills have a great export potential. For example, the Saint Petersburg Paper Mill observes the supplies of banknote paper for the Bank of India. All consumer specific requirements were considered during the paper production. The Bank of India representatives more than once inspected the papermaking process and the outcome always had positive results. The order was executed to the full extent and within the prescribed time limits.

WATERMARK AS AN ELEMENT OF THE CORPORATE STYLE

The paper mills of Goznak offer opportunities for creating an original corporate style (and at the same time providing a certain level of security) to general businesses as well.
«For that purpose, we can create office paper with both standard and individual watermarks, made to order», explains Alexey Filippov. «We have

multipurpose paper with watermarks – «Piramida», «Reshetka», «Impuls», «Lilia» etc. – to produce business correspondence and create stylish corporate documents».
In 2014, corporate paper with watermarks made at the Saint Petersburg Paper Mill received an award at the «100 Best Goods of Russia» competition.
Additionally, any organization may order the production of corporate paper with a specific watermark, e.g. an emblem or a logo of the company, a portrait or an indicator of memorable dates.
«The Saint Petersburg Paper Mill guarantees high quality of products, confidentiality of the order and eliminates any possibility of supplying the same watermark to other customers», emphasized Alexey Filippov.
By the way, the minimum amount to place an order for corporate paper with an individual watermark is 5,000 sheets.

UNIQUE PRODUCTS FOR EVERYONE INTERESTED

Cartographic paper used for printing various maps and atlases is a unique item in the variety of goods produced at the Saint Petersburg Paper Mill.
According to Deputy Director of Production of the Saint Petersburg Paper Mill Alexander Pyanykh, cartographic paper is very durable in both dry and wet conditions, and its quality makes it possible to reproduce even tiniest details of any map.
In addition, the Saint Petersburg Paper Mill is the only manufacturer of diagram paper intended for production of diagram bands, disks and documents utilized in recordkeeping appliances and devices.
«The Saint Petersburg Paper Mill has occupied a sizable niche in the Russian graphic and art paper market for quite some time», noted Head of Sales and Logistics Division of the Saint Petersburg Paper Mill Alexey Filippov. Here at the Saint Petersburg Paper Mill a special kind of drawing paper known on the market as «Goznak's Whatman paper» was created. The paper's unique feature is its ability to preserve its exterior characteristics even after multiple erasures.
Another key place in the variety of products of the Saint Petersburg Paper Mill occupies painting paper, including paper with added cotton. It is intended for painting with watercolors, tempera, gouache and drafting ink. Adding cotton fibers to the components increases its durability. These types of paper are continuously popular with schoolchildren, students, artists, architects as well as those for whom painting is just a hobby.
Painting and drawing paper produced at the Saint Petersburg Paper Mill have participated in the «100 Best Goods in Russia» competition and numerous times received awards and appreciation.
Among other products, the Krasnokamsk Paper Mill produces paper base for fliselin wallpaper, white and colored offset printing paper, as well as copying and packing paper.
Largest printing, wallpaper, food, chemical and other companies have been using these products for many years.
Paper produced at the Krasnokamsk Paper Mill has been awarded at the «100 Best Goods in Russia» competition several times.

How to order/purchase the Saint Petersburg Paper Mill products

1. Please send us a request:
– fill in a special form at Saint Petersburg Paper Mill website: http://goznak.ru/order/papers/spbf/
– or send a request to goznak_spbf@goznak.ru
– or contact the managers of the mill by phone: + 7 (812) 305-22-04 or + 7 (812) 305-22-43

Please state paper type (see the assortment at http://spbf.goznak.ru), desired volume, and provide contact information and your company details in the request.

2. If the paper is in stock – we will issue an invoice, and, upon request, a contract can be concluded. The product deliveries within the territory of Russia are carried out individually.

If the product is made to order, we will send you a business proposal. After the agreement has been reached and the payment is received, your request will be added to the manufacturing schedule. The production time is agreed upon individually and depends on the type of paper ordered and current production load.

Slavyana RUMYANTSEVA
Lyudmila MAXIMOVA

Everything begins with water

About 10 liters of water are required to produce an ordinary sheet of paper of A4 size. The quality of the water applied affects the sheet's production to a considerable extent. Moreover, the ecological situation in the region where the paper mill operates depends directly on how sensibly the water resources are treated and how much attention is paid to sewage water treatment at the mill.

For nearly two centuries, the Saint Petersburg Paper Mill – Branch of Goznak has been operating on the Fontanka river embankment. The river is the water source for the mill. However, the water quality in the Fontanka is far from perfect. Therefore, the water obtained from the river should first pass a preparation procedure – a combination of physical, chemical, biological processes of treating the original water to conform its quality in accordance with the papermaking technology requirements.

The Saint Petersburg Paper Mill contains a water treatment station, where modern technologies are applied for water processing. Using gravity, water flows into the pumping plant via the water intake system installed in the Fontanka river. The construction of the water intake device provides even entry of water. Additionally, the water is cleaned from large particles, thus complying with the water basin fish protection requirements.

The water treatment process consists of two stages. First, agents are added to the water obtained from the Fontanka. The water is directed to flotation units, where admixtures are adsorbed by air bubbles and are removed, together with foam. After the flotation, the refined water arrives at rapid sand gravity-type filters. Here, the filtering process takes place. Then, the purified water goes to production,

Water treatment plant at the Saint Petersburg Paper Mill

THE PROCESS OF CONFORMING WATER IS THE PRIMARY FOCUS OF WORK OF THE PAPER MILLS' SPECIALISTS, AS THE QUALITY OF THE FINAL PRODUCT DEPENDS ON ITS RESULTS.

and the mud (silt) is drained and utilized. The mill uses a near closed circulating process of water purification – the water used for washing the filters (i.e. “wash water”) is also purified and returned to the production cycle. In addition, the conditionally pure water collected at the mill is also returned to the water treatment station.

“The volume of using circulated water grew in 2017 due to the application of local systems of waste water treatment to the technological flows of the papermaking machines. It enables us to use the natural resources more efficiently, decrease the volume of waste water and finally reduce the negative impact on the environment”, said the Head Engineer of the Saint Petersburg Paper Mill Sergey Osadchiy.

The technological process of water treatment management is fully automated. It is carried out with the help of a computer system, under the supervision of the water treatment station personnel. The system automatically provides permanent water pressure at the output of the station during flow variations, regulates the pump efficiency, controls the indexes of the water treatment technological process, and automatically corrects the dosage of agents with the change in purified water flow quality. The operation of flotation units and sand filters is also fully automated.

The Saint Petersburg Paper Mill’s water treatment station contains a laboratory equipped with devices for water quality control at various stages of its preparation.

Another branch of Goznak – the Krasnokamsk Paper Mill – has its individual water treatment station as well. Here, water from the Kama river is used. Much like the Fontanka river, Kama’s original water quality does not comply with the technical requirements of water used for papermaking.

Three types of water are produced at the water treatment station of the Krasnokamsk Paper Mill: technical, softened and fire extinguishing water. Technical water is used in all departments, such as paper pulp preparation, repulping and papermaking workshops, during the production of chemicals for paper coloring etc. Softened water, i.e. water with decreased hardness, is applied for specialized equipment.

“The technical water treatment station of the Krasnokamsk Paper Mill was launched in March 2016. Today’s process of water treatment is quite different from previous ones”, said Stanislav Demin, section foreman of the technical water treatment station of the workshop of heat and water supply, ventilation and conditioning of the Krasnokamsk Paper Mill of Goznak. “At the old water-treatment plants, slime sedimentary occurred due to a longer contact of water and agents in the slop drums. The mature flocks (floccules) settled under their own weight, without additional raw materials in the shape of micro sand, and, as a result, huge basins were used. At the new station, a modern technology is applied by one of the leading companies in the water treatment field, making the water treatment process more dynamic. We have managed to downsize the building space and improve the treated water indexes, considering water treatment during winter season as well. The modern technology also allows us to bring all water used in the filter washing and received during the slime draining back to the reactant treatment cycle”.

The paper mills of Goznak also pay special attention to local treatment of sewage water received during the production process. After all, there are guidelines of waste water disposal into the public drainage system, and to comply, it is necessary to filter the sewage water beforehand.

The system of local treatment of sewage water implemented at the Saint Petersburg Paper Mill makes it possible for the production process to meet all the existing requirements. That means the Saint Petersburg Paper Mill contributes to improving the ecological situation in Saint Petersburg and the region of the Baltic Sea overall.

In 2018, the Saint Petersburg Paper Mill will continue to improve the sewage water treatment systems. It will enable us to comply with the Ecological Protection requirements, taking into consideration toughening of both Russian Ecological protection legislation, as well as International guidelines.

Slavyana **RUMYANTSEVA**

Coins to Admire

THREE COINS MINTED AT GOZNAK WERE DISTINGUISHED AT “COIN CONSTELLATION-2017”

“Coin Constellation” Competition: The awarding ceremony

The results of “Coin Constellation” competition of commemorative coins (the only coin competition held within the territory of Russia) traditionally reflect the current tendencies in the commemorative coin market. In 2017, the jury distinguished three coins issued by the Bank of Russia and produced at the Saint Petersburg Mint. “The Great Imperial Crown” coin (special edition) with the face value of 25 roubles won the “Successful Artistic Solution” category, “The Historic-Architectural Ensemble of the Novodevichy Convent in Moscow” 1-kilogram coin was awarded the “Gold Coin of the Year”, and “The 150th Anniversary of Foundation of the Russian Historical Society” gold 50-rouble coin was awarded second place in the “Coin Classics” category. The success yet again has demonstrated the high quality and artistic value of Goznak coin products. The leading artist of the Design Center of Goznak Anton Schablykin was the author of all three coins.

SUCCESSFUL ARTISTIC SOLUTION

“The Great Imperial Crown” silver 25-rouble coin (special edition) that won the Successful Artistic Solution category was issued by the Bank of Russia within the framework of the “Diamond Fund of Russia” series.
The series includes coins with the images of the state regalia from the Diamond Fund of Russia, including the great imperial crown. The crown was created for the coronation of Empress Catherine II in 1762 by the court’s jeweler Georg Friedrich Eckart and craftsman Jérémie Pauzié.
It is decorated with 4,936 diamonds and the most famous jewel of the crown – a spinel of a bright ruby colour.
“On the special edition coin, the transparent enamel is applied to the metal in such a way that the outline shines through it”, says Anton Schablykin. “The outline of the crown is complicated in its detail. At the same time, it is not de-glossed, like other outline details of most of classic coins. Due to the metallic luster and detailed faceting that required additional efforts from the engravers and program developers, the flicker of diamonds on the coin can be clearly observed. The faceted metal reflects light like faceted crystal and diamonds would. The technology and the method of refinement of a non-deglossed surface adds a distinctive “diamond aura” to the whole coin series”.
The Crown of the Russian Empire is depicted against the background of a traditional Russian pattern. Moreover, the background is de-glossed, and as a result, the shimmering image of the crown has a clearly defined outline. The background details do not distract from the main focus of the composition.
Sculptor Alexandra Dolgopolova and the specialists in the hardware department, who designed the minting tools, played a special role in creating the coin. Every facet of every diamond in the crown was processed manually. Every jewel in the crown was perfected separately.
“The Great Imperial Crown” coin in the special edition was produced as an addition to the main lot”, explained Sergey Evstratov.

“The Great Imperial Crown” coin (special edition, 2016)
Denomination: 25 rubles
Metal, fineness: silver 925/1000
Fine metal content not less than: 155.5 g
Diameter: 60.00 mm
Mintage: 150 pieces
Manufacturing quality: “proof”
Artists: Elena Kramskaya (obverse), Anton Schablykin (reverse)
Sculptors: Alexandra Dolgopolova (obverse, reverse).

“Special edition coins stand out for their detailed exertion of outline and additional technological solutions. Such coins are issued in limited amounts – one tenth of the general lot. Unique tools are created and employed for such limited editions.
The technical methods used for the creation of “Great Imperial Crown” coin are quite common. The secret of the coin’s success is skilled combination of these technical methods that allowed to achieve a prominent result.

GOLD COIN OF THE YEAR

“The Historic-Architectural Ensemble of the Novodevichy Convent in Moscow” one-kilogram gold coin, awarded by the jury of “Coin Constellation” the gold coin of the year, was issued within the framework of “Russia in the UNESCO World Culture and Nature Heritage” series.
“Creating the coin, we wished to show a panoramic view of the monastery and relate its history. Choosing from many images, we selected a view of the monastery depicted from a bird’s eye perspective,”, Anton Schablykin said. “There is an outlined image of the Novodevichy Convent of the Smolensk Icon of the Mother of God on the mirror surface of the disc found on the reverse side of the coin. There is a miniature from the Illuminated Compiled Chronicle located above it, which tells the story of the construction of the monastery. At the bottom, there is an image of the seal of Vassily III, who initiated the founding of the monastery. We tried to tell the monastery’s history that is full of dramatic events, in a language suitable for a coin, and, at the same time, we tried not to outshine the architectural ensemble”.
“The Historic-Architectural Ensemble of the Novodevichy Convent in Moscow” coin is truly unique”, ascertains Head Engineer of the Saint Petersburg Mint Sergey Evstratov, “The coin exhibits prominent level of engraving work, as well as high levels of detailing. A few years ago, we could not achieve such detailing on the coin. Yet today’s technologies allow our 3D modelling specialists to enhance the artist’s work with additional information by means of numerous details”.
The miniature from the Illuminated Compiled Chronicle is created on the coin by means of laser de-glossing. The components of the laser graphics represent reproductions of miniatures, i.e. historical documents. The specialists managed to achieve a high-quality image despite the elevated outline. Much of that credit goes to Sculptor Alexander Bessonov.

“The Historic-Architectural Ensemble of the Novodevichy Convent in Moscow” coin (2016)
Denomination: 10,000 roubles
Metal, fineness: gold 999/1000
Fine metal content: 1000.0 g
Diameter: 100.00 mm
Mintage: 59 pieces
Quality: “proof-like”
Artists: Elena Kramskaya (obverse), Anton Schablykin (reverse)
Sculptors: Alexandra Dolgopolova (obverse), Alexander Bessonov (reverse)

The diameter of the one-kilogram coin is 100 mm. Not many mints in the world have an opportunity to strike coins of that size. Yet even bigger coins are produced at the Saint Petersburg Mint.
For example, 5-kilogram gold coins issued to commemorate the 150th anniversary of the Bank of Russia (2010) and the 175th of the thrift industry in Russia (2016) have the diameter of 130 mm, and the 5-kilogram silver coin minted to commemorate the 200th anniversary of the victory in the Patriotic war of 1812 (2012) is measured 150 mm in diameter.

COIN CLASSICS

“The 150th Anniversary of Foundation of the Russian Historical Society” gold coin features Nestor the Chronicler, a work by Sculptor Mark Antokolskiy. The coin won second place in the “Coin Classics” category.
“This coin is truly a classic creation – it exhibits a vivid silhouette with matte outline", commented Anton Schablykin. “The coin has no traditional background. The classic image of the famous sculpture was made using the classic technical methods – outline and “proof”. It is the image of a classic sculpture, and nothing else”.
It is important to choose the best angle and produce perfect mold when creating coins like “The Russian Historical Society”, for the coin not to turn out flat but come out vivid and artistically valuable.
The coin production technology also dictates its conditions – if the “proof” technology is applied during the minting process, then the image should have a distinct and accurate silhouette uniting the entire composition. When the coin is small, a person looking at it should read not only the basic graphic moments, but the artistic idea as well. A small coin is a sort of a symbol, an artistic hieroglyph, and nothing should prevent its translation. The coin size dictates artistic laconism.

WELL DESERVED SUCCESS

At the Saint Petersburg Design Center of Goznak, i.e. Anton Schablykin’s work location, every artist is also a graphic designer, a sculptor and a specialist capable to carry out creator’s control at the production site. Every artist should understand the abilities existing in applied equipment, materials and technologies.

"The 150th Anniversary of Foundation of the Russian Historical Society" coin (2016)
Denomination: 50 roubles
Metal, fineness: gold 999/1000
Fine metal content: 7.78 g
Diameter: 22.6 mm
Mintage: 1000 pieces
Manufacturing quality: "proof"
Artists: Elena Kramskaya (obverse), Anton Schablykin (reverse)
Sculptors: Alexandra Dolgopolova (obverse), Alexander Bessonov (reverse)

"Winning three prizes at the "Coin Constellation" competition this year, we have confirmed Goznak's quality and high-level skills of our specialists", noted Head of Department of Marketing and Sales of the Saint Petersburg Mint Mikhail Goncharenko. "The secret of the success of the coins produced at the Saint Petersburg Mint at the "Coin Constellation" competition is the artists' meticulous work under the supervision and with direct involvement of Head Artist of the Design Center Alexander Baklanov", ascertains Konstantin Krokhmal, Director of the Saint Petersburg Mint.
"The product's idea always starts with a sketch, and the objective of the Mint is to convey the artist's idea in metal form".
"Every artist wishes to create beautiful, modern, original and well-thought-out coins", says Anton Schablykin.
"It is important not to lose the feeling of material, theme and common sense. The commemorative coin becomes more and more interesting, variable and understandable to a common person. No doubt that there is a coin trend, but everybody knows that "to keep up with a trend, one should walk slightly behind it". Therefore, technical novelties and inventions in the coin business may be at high levels, but they are definitely not above the artistic image. They should serve faithfully to the artistic thought expression. The coin gradually occupies more and more space in the modern culture. In addition, there may possibly come a time when a coin, similar to a work of art, might change a person and influence his mind, feelings and understanding of the world.

The one and only in Russia

In October 2016, within the territory of the Saint Petersburg Mint – Branch of Goznak, commenced the only Medal Artist's Class in Russia (a structural division of the Saint Petersburg State Academic Institute of Painting, Sculpture and Architecture named after Ilya Repin under the Russian Academy of Arts). Professor Alexander Baklanov, a People's Artist of the Russian Federation, Head Artist of the Design Center of Goznak and the author of design of many Russian commemorative coins, became the Head of the Medal Artist's Class.

The very first medal artist's class under the Academy of Arts was established in Saint Petersburg at the end of the 18th century. Professional training of medal artists in Russia virtually ceased in the 1920s. Consequently, educating on the specifics of work with coins and medals took place exclusively at production site. Establishment of the Medal Artist's Class incorporated into the Institute of Painting, Sculpture and Architecture named after Ilya Repin (it is a new personal workshop at the Sculpture Department) has revived the tradition of professional approach to training medal artists. Classes in the private workshops of Repin's Institute start on the third academic year. At the Medal Artist's class, the students study not only painting, sculpture and composition (with focus on the medal craft), but also the technology of medal production, engraving and the history of the medal art.
According to Alexander Baklanov, medal artists today should be comprehensively educated specialists. They should be able to paint, model, work in the modern computer 3D modeling programs, understand the coin and medal production technology, recognize nuances of working with tools and particularities of metal processing.
"Medal art is a complicated and delicate work, it requires knowledge and skills", said Alexander Baklanov. "On one hand, the demand for the medal artists is not very high. On the other hand, they are "goods sold by the piece", and Goznak and other enterprises require such specialists. However, one should earn this merit, because the requirements are very high, and the conditions are tough. Of course, a talent is essential, as well as skills. However, it is also important to understand that our work requires discipline, regard for schedules and plans' completion. Naturally, it is very important to love one's work, literally live by it, since there is no commendable medal artist without it.

Slavyana RUMYANTSEVA

The Saint Petersburg minting – guaranteed quality

SINCE 2008, THE SAINT PETERSBURG MINT HAS BEEN A SUPPLIER OF THE MOSCOW KREMLIN AND A MEMBER OF THE GUILD OF THE KREMLIN SUPPLIERS

The Saint Petersburg Mint celebrated its 293rd anniversary in 2017. The enterprise was founded according to the decree of Peter the Great; its history started in 1724 when there appeared the first one-rouble coins with “SPB” sign. The mint has been incorporated into Goznak since 1941. Throughout its history, the Saint Petersburg Mint has been manufacturing products under the state orders – minting coins, creating awards, commemorative medals and signs. The untarnished reputation of the Saint Petersburg Mint is a result of work of many generations of coin makers.

Today the Saint Petersburg Mint is an enterprise equipped with the most cutting-edge machinery and technologies. The high-tech production site of the Mint makes it possible to execute even most difficult orders within short timeframes. The specialists of the plant have mastered the technologies of production of coins with the weight from 1.55 g to 5,000 g (in purity) and with the diameter from 12 mm to 150 mm. They are able to produce coins and medals of practically any configuration of base and precious metals.

Since 2008, the Saint Petersburg Mint has been a supplier of the Moscow Kremlin a member of the Guild of the Kremlin suppliers. In 2004, the enterprise received an order for the production of the commemorative medal on the occasion of Vladimir Putin’s inauguration. Since then, the Saint Petersburg Mint has been manufacturing medals for all the inaugurations.

“The equipment is modernized constantly at the Saint Petersburg Mint. Thanks to that, we are able to realize most challenging ideas and solutions”, says Mikhail Goncharenko, Head of Marketing and Sales Department of the Saint Petersburg Mint. “The enterprise possesses technologies of minting and casting; besides, various technologies of surface processing can be combined in the products manufacture”.

“Our building is historical, but the “filling” (i.e. the equipment) is modern”, says Igor Prokofiev, Deputy Director of Production of the Saint Petersburg Mint.

The Saint Petersburg Mint has carried out the main volume of works connected with realizing “Sochi 2014” coin programs (issue of investment and commemorative coins dedicated to the 22nd Olympic Winter Games and 11th Paralympic Winter Games of 2014 in Sochi) and “Football 2018” (issue of investment and commemorative coins dedicated to holding 2018 FIFA World Cup and FIFA Confederations Cup 2017 within the territory of the Russian Federation). Within the framework of “Sochi 2014” coin program, the Saint Petersburg Mint produced 34 kinds of commemorative coins of precious metals in the total number of 716,903 pieces, 9 kinds of investment coins of precious metals in the total number of 1,490,046 pieces and 4 kinds of commemorative coins of the copper-nickel alloy in the total number of 80 million pieces.

“The work upon “Football 2018” coin program is another extremely important project for us. The editions are huge, and the coins are technologically complicated. The order execution allowed us to prove yet again that the Saint Petersburg Mint copes with even most important orders with high quality requirements”, says Igor Prokofiev.

The Saint Petersburg Mint is certainly oriented at large-circulation products mostly; however, it executes small orders too and produces various signs, medals, corporate awards, jewelry.

“We strive to be a client-oriented company”, says Mikhail Goncharenko. “We try to strike a compromise and satisfy the clients’ needs”.

“One of our major competitive advantages is consistent high quality. Besides, our artists are excellent professionals providing a high artistic level of any products struck at the Mint,” Igor Prokofiev explains.

How to order products of the Saint Petersburg Mint

1. Please send a request:
– fill in a special form at http://goznak.ru/order/coins/spmd/,
– send a request to info@mintspb.ru
– or fax No.: +7 (812) 324-14-48, +7 (812) 324-14-74
– or contact specialists of the Mint by telephones +7 (812) 324-14-74, +7 (812) 324-14-20, +7 (812) 324-14-48, +7 (812) 324-14-71

Please write the product’s characteristics (a kind of product, metal, manufacturing quality) and quantity in your request.

2. The specialists of the Saint Petersburg Mint contact the customer and agree upon the details of the future order.

3. If necessary, the artists of the Saint Petersburg Mint draw a sketch to be approved by the customers. Or the work may be carried out in accordance with the customers’ sketch.
4. We conclude a contract
5. We produce a sample
6. The customers approve the sample
7. The lot of products is manufactured.

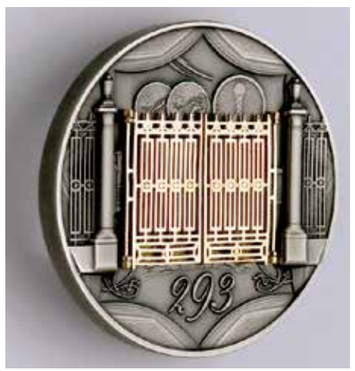
One may buy finished products of the Saint Petersburg Mint at the Numismatic Salon (Peter and Paul Fortress, Nikolskaya Kurtina) daily at 10:00–18:00. Telephone +7 (812) 233-93-03

Elena KISELEVA

The Saint Petersburg Mint has combined minting and casting

According to a tradition, the Saint Petersburg Mint strikes commemorative tokens demonstrating its technological and technical abilities for its birthday.

In 2017, for the 293rd anniversary of the Saint Petersburg Mint, commemorative tokens demonstrating the opportunities of combination of minting and casting were manufactured.
The tokens (the design author is Sergey Kornilov, Head of the Artistic Bureau of the Saint Petersburg Mint) are produced in two variants. Their design is practically identical, but a stylized fence “in front of the Tsar’s porch” created by Architect L. Benua according to the model of the fence of the Summer Garden is added to one of them. The gates of the fence are made using the casting method and are a moving element – they can open and close.
“ It turned out to be an interesting token with complicated, multilevel minting and firm attachment of the gates to the token”, commented Sergey Kornilov. “ Our technologists coped with all the technological difficulties, including very fine casting”.
In the upper part of the tokens, there are relief images of commemorative coins struck at the Saint Petersburg Mint in 2017; they are dedicated to holding FIFA Confederations Cup 2017 and 2018 FIFA World Cup in Russia.
On the reverse of the tokens, there is a relief image of a replica of the “poltinnik” coin of 1924, Goznak’s logo and the angel of Saints Peter and Paul Cathedral.
“When creating the tokens of 2017, we wanted to accentuate belonging of the Mint to the history of Saint Petersburg, the history of the Peter and Paul Fortress. Thus there appeared an idea to show a view of the Saint Petersburg Mint from the side of the Imperial shrine, via Benua’s famous fence», Sergey Kornilov explains.



The Saint Petersburg Mint struck commemorative tokens dedicated to the 50th anniversary of for stations of the Saint Petersburg Metro in November 2017.

A collection of tokens for the Saint Petersburg metro

Collectors of two categories collect metro tokens – collectors of tokens of any kinds and metro token collectors. Moreover, those collecting everything connected with the metro buy the tokens for their collections too.
The Saint Petersburg metro is the only in Russia and possibly in the world issuing regular series of commemorative tokens. Today commemorative tokens in blisters and capsules are much more expensive in the numismatic markets than when they were sold in the metro, moreover, some issues are very difficult to find and buy.
“Our cooperation with the Saint Petersburg Metro started practically as soon as it was opened. In 1958 the Mint stroke the first tokens for the Leningrad Metro. Then they started using 5-kopeck coins that we also stroke. And later on, the tradition of minting tokens was resumed”, said Mikhail Goncharenko, Head of Sales and Marketing Department of the Saint Petersburg Mint. “Since 2005, the metro started the tradition of minting jubilee tokens that may not only be applied as a means for entering metro, but are also souvenirs and collection items”.
All issues of the jubilee tokens are made in the same style – all together they represent a unique collection. However, at the same time every token has an artistic detail uniting all themes of the issue. Thus, in the issue of November 2017, there is the same laurel branch on every token.
There is also a security raster element on all the tokens – at different viewing angles, figures “1967” and “2017” appear on the riffled metal area.