
RCC
KYSHTYM COPPER
ELECTROLYTIC PLANT

01

ABOUT THE PLANT

KMEZ is one of the oldest metallurgical plants in the Urals. The plant was founded in 1757 by Nikita Demidov — son of the famous industrial dynasty of Demidovs.

Initially there were two plants: Verkhne-Kyshtym — cast-iron smelter and Nizhne-Kyshtym — iron works. But they were taken as a single plant, the products of which — iron of the "Two Sables" brand — were famous both in Russia and abroad.

An important milestone in the history of the plant was 1908, when it was acquired by the Scottish millionaire entrepreneur Leslie Urquhart. He converted the iron works into copper electrolytic production. As a result, the Kyshtym plant was one of the first in Russia to start copper electrolysis. In addition, the Scottish entrepreneur introduced at the Ural plant some elements of the precious metals — gold and silver — production from the sludge remaining after copper electrolysis. Back then, the refining process itself was carried out in England, but preparatory work was carried out in Kyshtym.

Throughout the 20th century, the Kyshtym plant retained its position as a strong metallurgical smelter. In 1970–1975, it was part of the Karabash copper-smelting plant, and later became part of the Uralelectromed plant along with the Pyshminsky copper-electrolytic plant. In 2004, the Kyshtym Copper Electrolytic Plant became part of the Russian Copper Company Group.

RUSSIAN COPPER COMPANY

Russian copper company (JSC RCC) is one of the three largest copper producers in Russia.
Founded in 2004. RCC's business assets are located in the Chelyabinsk, Sverdlovsk, Orenburg, Novgorod regions, in the Khabarovsk Krai and in the Republic of Kazakhstan.
The RCC Group includes eight ore mining plants, a hydrometallurgical plant, three metallurgical plants and a trading company.
These plants together carry out a full production cycle — from mining and processing of ore to release and sale of finished products. RCC produces copper concentrate, copper cathodes and wire rod, zinc concentrate, refined gold and silver.

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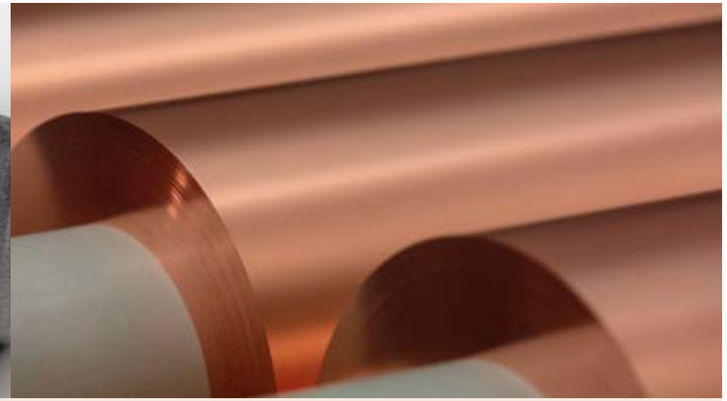
PRODUCTION

The main activity of JSC KMEZ is fire and electrolytic refining of blister copper. The plant produces copper cathodes, copper wire rod, electrodeposited copper foil and precious metals.

More than 70% of copper cathodes is intended for the production of copper wire rod, the rest are sold on the external market. Copper rod is fully supplied to the external market. KMEZ also exports 40% of copper sulfate.



Products

- Copper cathodes (GOST 546-2001)
- Copper wire rod (TR 1844- 10-03292517-2004)
- Electrodeposited treated (electroplated) copper foil (TR 24.44.25-049-05774969-2020)
- Electrodeposited copper foil for LIB (TR-24.44.25-050-0577496 9-2020)
- Copper sulfate Grade I, rate A (GOST 19347-2014)
- Reagent Copper (II) sulfate pentahydrate, grade «pure» (GOST 4165-78)
- Reagent Nickel (II) sulfate heptahydrate grade «pure» (GOST P 51572-2000)
- Gold weighted bullion bars (ГОСТ Р 51572-2000)
- Gold ingots (GOST 28058-2015)
- Silver ingots (GOST 28595-2015)
- Refined platinum (GOST 31290-2005)
- Palladium on carbon (TR 1794-015-05774969-2013)
- Selenium technical-grade (TR 1769-042-05774969-2013)

Electrodeposited copper foil

In 2021 KMEZ started production of electrodeposited copper foil in a new workshop. The workshop capacity is 1,200 tons per year.

This is the only such production in Russia, designed to fully meet the demand for this type of product of domestic manufacturers of printed circuit boards and lithium-ion batteries.

Main characteristics of the foil

Thickness ..... 9 – 105 μm
Width ..... up to 1 320 mm

Application

< 20 μm

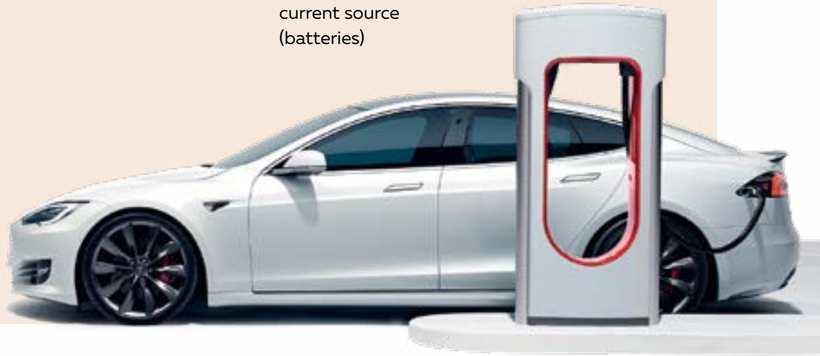
- rigid and flexible foil dielectrics
- multilayer printed circuit boards
- lithium ion batteries

20–50 μm

- rigid and flexible foil dielectrics
- microwave dielectric
- multilayer printed circuit boards
- primary chemical current source (batteries)

> 50 μm

- rigid and flexible foil dielectrics
- noise shielding
- switching equipment



03

MANU-FACTURING PROCESS

Main steps of the process chain:

Copper fire refining

The copper fire refining process is carried out in the copper smelting division on two furnaces: MAERZ with a capacity of 125 thousand tons of anode copper per year and AN-1 with a capacity of 45 thousand tons of anode copper per year. Dosed copper casting is carried out at the M-24 casting complexes of WENMEC SYSTEMS (Sweden) and M-15 OUTOKUMPU (Finland) carousel type with weight dosing.

>1 800 mln tons

of cathodes were produced by KMEZ in 2004–2020.

>1 200 mln tons

of copper wire rod was produced by KMEZ in 2004–2020.

Copper electrolysis

Electrolytic refining of copper is carried out in the electrowinning plant with a baseless technology. Copper cathodes are manufactured in the process of copper deposition on stainless steel plates. Washing and stripping of copper cathodes, weighing and strapping of packs is carried out in automatic mode on Cathode Stripping Machines manufactured by OUTOKUMPU and OUTOTEC (Finland).

Due to the ISAKIDD Technology, it is possible to achieve high purity of cathode copper: the average copper content in the cathodes is 99.997%.

In the refining department of the electrowinning plant, refined gold, silver and other precious metals are produced from the sludge formed during the copper electrolytic refining and from secondary raw materials with technology and equipment from OUTOKUMPU (Finland).

Copper rod production

Copper rod (raw material for drawing) with a diameter of 8 mm is made of cathode copper grade M00k in accordance with GOST 859 by the continuous casting and rolling on the equipment by SOUTHWIRE (USA), MORGAN (England), SIEMENS (Germany). The developer of technology is SOUTHWIRE company (USA).

Consistently high quality is guaranteed by the use of our own cathode copper, automation of all stages of the technological process, continuous surface quality control, modern laboratory equipment for determining the physical and mechanical properties of wire rod and its chemical composition. The capacity of the wire rod production division is 140 thousand tons per year.

Copper foil electrolysis

Electrodeposited copper foil is manufactured by electrodeposition of copper on a rotating drum-cathode. It isimmersed in a sulfuric acid electrolyte andexposed to an electric current. Then the foil surface is treated on the coating device (Treater) in order to increase its adhesion to the dielectric and impart oxidation resistance. The raw material for electrodeposited copper foil is copper wire rod of KMEZ own production with a coppercontent of 99.96%.

All main technological equipment for the division was manufactured by world leaders in this field — Japanese companies NEW LONG MACHINE WORKS, Ltd. and MITSUBOSHI.

04

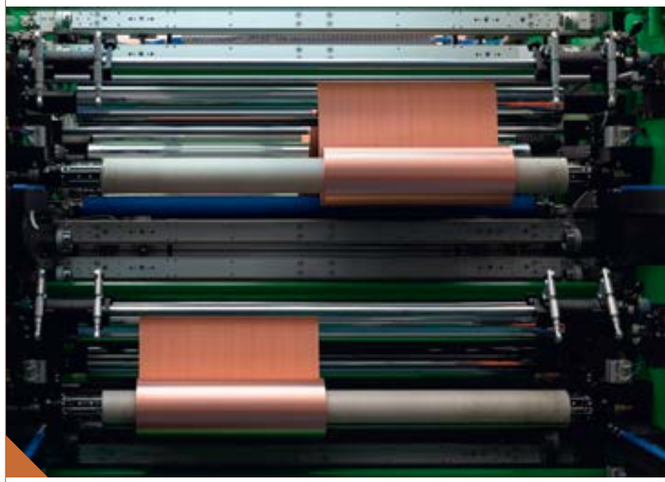
FOIL ELECTRODE-POSITION DIVISION

Foil production process includes the following steps:

Copper dissolving and preparation of sulfuric acid electrolyte

«Raw» foil treatment on a foil coating device (Treater)

Obtaining «raw» foil on ED cells



Cutting and winding of commercial products

> Basic engineering of the foil electrodeposition division and the transfer of process technology were carried out by KONTEX INTERNATIONAL Inc. (USA).

05

INVESTMENT

Since the moment KMEZ entered RCC Group in 2004, the plant has been implementing a comprehensive modernization project and technical upgrading.

Investment in production development — 2016 to 2020.

RUB mln.

2016	**113,3**
2017	**382**
2018	**905**
2019	**2 100**
2020	**4 000**

>9.5 billion rubles invested in KMEZ development from 2004 to 2020.

2005

New electrowinning plant was built, which led to an increase in the production capacity of copper cathodes by 1.6 times, up to 120 thousand tons per year.

2007

Copper wire rod manufacturing division was put into operation. Technology and equipment of the American ompany Southwire made it possible to increase production tenfold: from 10 thousand tons to 100 thousand tons.

2010–2013

Two new sludge kilns were installed in the refining division, a distillation furnace was launched, a new copper leaching reactor was installed, and a modern Diefenbach chamber-membrane filter was put into operation. (Italy).

2015

A new Cathode-Stripping Machine by OUTOTEC (Finland) was installed in the electrowinning plant department No. 1, and the titanium cathode plates were replaced with stainless steel plates.

2013–2016

Modernization of the plant's lighting system with lighting equipment from the Dutch company Philips, which provided savings of up to 1,000 thousand kWh of electricity per year and improved working conditions.

2018

Additional equipment was installed in the electrowinning plant and in the Copper Rod production division. This increased the production capacity of copper wire rod by 40%, up to 140 thousand tons per year; and copper cathodes by 15% — up to 140 thousand tons per year.

2019

Start of the electrowinning plant technical modernisation, which will increase the cathode production capacity from 140 thousand to 230 thousand tons per year.

2021

Completion of a new copper foil electrodeposition division construction.

Main products output in figures (thousand tons)

	Cathodes	Wire rod
2016	**122**	**94**
2017	**129**	**95**
2018	**139**	**88**
2019	**132**	**107**
2020	**136**	**94**

06

OUR TEAM

>1 200

people work
at KMEZ

47 years

average age
of employees

3,4%

average personnel
turnover over the past
five years

It is considered
prestigious to work
at the Kyshtym Copper
Electrolytic Plant.

Staff development
Plant trains employees under License of Ministry of Education and Science of the Chelyabinsk Region. The training facilities of KMEZ includes a computer class equipped with 15 computerized places, and two classrooms. Annually, on average, 442 employees undergo occupational training and more than 900 people every year refresh their knowledge in the field of occupational health and safety. Two or three employees every year receive a bachelor's degrees without discontinuing work at the expense of the plant.

Workplace safety

The plant has introduced a procedure for workplace assessment (special assessment of labour conditions). There is an approved regulation on conducting a special assessment of working conditions at KMEZ. The occupational health management system and the industrial safety management system have been introduced and are being continuously improved. Their current editions were adopted in 2020 and 2021, respectively.

KMEZ has a license to operate explosive, fire and chemically hazardous production facilities of I, II, and III hazard classes. All the hazardous production facilities were identified, registered and insured. Currently KMEZ has 10 such objects.

Control of the hazardous production facilities compliance with industrial safety requirements is carried out in accordance with the Regulation on the organization and performance of manufacturing inspection of hazardous production facilities compliance with industrial safety requirements.

07

RESPONSIBILITY

KMEZ is one of the largest local employers of the Kyshtym urban district.
Throughout its history, the plant has been a reliable social partner of the municipal administration.

More than 8.6 billion Rubles
KMEZ transferred to all levels of budget and non-budgetary funds in 2005–2020.

260 million Rubles
were transferred by KMEZ to charity in 2004–2020.

RUB mln.

8 657 mln. RUB
Payments to the budget and extrabudgetary funds

3 899
federal budget

2 680
regional

2 078
local budget and extra-budgetary funds

Attractive employer

Main points of social protection and guarantees for employees are reflected in the collective agreement between the administration of the plant and the staff.

Plant provides assistance to the plant veteran organization. Veterans have the opportunity to meet in their Veteran club. In accordance with the collective agreement, four times a year they are paid material remuneration, and also onetime financial assistance is allocated for medical treatment.

Children's health camp «Rainbow» annually accepts up to 800 children. The fee for a tour for parents, employees of the plant, is 5% of its total cost. This is the best rate among the mining and metallurgical plants of the Chelyabinsk region.

The plant recreation center «Travakul» is very popular among the employees. During the season, 1,300 people spend their vacation there.

Social partnership

Every year RCC, KMEZ and administration of the Kyshtym urban district conclude an agreement on social partnership. Under this agreement, the company provides assistance in the environment and landscape development, commemoration work in tribute to the Great Patriotic War heroes and maintenance of social facilities. With the support of RCC and KMEZ, a social projects competition among schoolchildren — "Change your city for the better" and children's KVN is held in the district. Children's theater groups, hockey and football teams receive financial assistance.

- 2017: landscaping of the Verkhne-Kyshtymsky pond embankment. Applying of mural painting to the XIX century architectural monument – Church of St. Nicholas the Wonderworker.
- 2019: installation of a helipad for medical aviation on the territory of the Kyshtym town hospital, at the expense of the plant. With the help of this helipad, in less than a year, more than 30 gravely ill patients were delivered to the regional center and other large cities hospitals.
- In 2019-2021, the plant assists in the restoration and transfer to the city center of an old fountain — an object of historical heritage.

Dynamics of the JSC KMEZ obligatory payments volume in 2016–2020. (RUB million)

Payments to budget and extra-budgetary funds

2016	2017	2018	2019	2020
239	541	748	849	927

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ENVIRONMENT

Environmental expenditures in 2016–2020 (RUB million)

Protection of Atmospheric Air

In order to reduce atmospheric emissions, modern and efficient gas cleaning equipment has been installed at the plant's main emission sources. These are wet gas cleaning units – scrubbers, jet-foam gas scrubbers, Venturi scrubbers, washing towers and dry dust collectors. Filter media of all bag filters is of high performance.

> In 2018, a new bag filter LÜHR FILTER (Germany) was installed at the plant main source of emissions - the MAERZ furnaces, new filter allows capturing up to 99% of impurities.

Protection of Water resources

Due to the modern waste water treatment and water preparation systems, the plant has stopped discharge of treated industrial and storm water into the environment. As a result, today at the industrial site of KMEZ, industrial wastes,storm and drainage water are being collected, treated and reused. The last stage of the wastewater treatment system modernization is planned to be completed in 2021 with the commissioning of a reverse osmosis unit.

Industrial inspection

Instrumental environmental control of the atmospheric air quality, industrial emissions, natural and waste water at is carried out by the plant own accredited environmental laboratory. The factory commission on a regular basis carries out industrial inspections in separate divisions of the plant.

Main projects

2011 installation of a filter complex by Diefenbach company (Italy) at the plant treatment facilities

2013 installation of a sludge firing furnace in the refining section of the electrowinning plant

2016–2018 installation of a new bag filter LÜHR FILTER (Germany) on the MAERZ furnace

09

WAY FORWARD

Today KMEZ is carrying out a full-scale technical modernization of the electrowinning plant aimed to increase the output and improve the quality of copper cathodes

First stage of the project includes the following steps:

- installation of 16 new additional groups of polymer concrete cells. Taking into account the capacity of currently operating electrowinning plant, the project will increase the output up to 230 thousand tons of copper cathodes per year;
- technical modernization and expansion of the existing refinery division; ♦
- reconstruction of transport infrastructure and internal logistics system; ♦
- modernization of the railway division with a warehouse for finished products.

The basic engineering for the technical modernization of the electrowinning plant was provided by the Finnish company OUTOTEC. Electrolysis polymer concrete cells were supplied by the Belgian company STEULER; 22,176 stainless steel cathode plates were supplied by Limpact Internetional Ltd. (Canada), the main equipment units (Anode Preparation Machine, Cathode Stripping Machine, Anode Scrap Washing Machine, etc.) by MESCO (Japan).

Next steps of the electrowinning plant technical modernization include commissioning of the second stage of the electrowinning plant with further decommissioning of the existing (old) electrowinning plant, construction of a new refining division, introduction of a radically new electrolyte purification circuit along with the construction of a new vitriol division, construction of a new boiler house, dismantling of buildings and structures that have become useless and complex site improvements in accordance with the general plan.

2021

JSC KMEZ

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