

RUSAL's Sustainable Development Technology and Environment

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Abstract

Along with the development of new technologies UC RUSAL is keenly focused on sustainable development and environmental issues.

RA-550 Technology, an advanced cell structure developed by RUSAL, uses a completely new busbar design using two-side current feed anode risers ensuring efficient magnetic field compensation in aluminium metal pad and excellent MHD stability without using additional magnetic field compensation. This ultra-high-amperage cell technology provides for amperage increase to more than 700 kA.

Energy-efficient anode assembly and dry gas scrubbers have been developed. Joint implementation of these technologies provides for CAPEX reduction by 75 %.

At the Company's smelters, energy-efficient cell technologies are being implemented that provide for reduction of energy consumption by 200 - 700 kWh/t, so the Company's annual savings amount to more than 100 millions kWh.

The Company continues to implement the technology of unshaped lining materials allowing for the recycling of up to 80 % of the spent material. Use of unshaped materials contributes to reduction of the environmental impact. Three smelters already make full use of this technology during pot relining.

An innovative technology has been developed to produce pitch by thermal dissolution of coal while achieving a 5 time increase in the yield ratio as compared to the traditional process and 3.5 time reduction of benz[a]pyrene emissions. The technology of petroleum coke calcination in short (45-m long) rotary kilns, including the use of tertiary air, has been implemented to produce coke of high density.

10 potlines have been switched over to Eco-Soderberg technology at Krasnoyarsk and Bratsk aluminium smelters. Also this technology is being implemented at Irkutsk, Novokuznetsk and Volgograd aluminium smelters. Concurrently with switching over of the potlines to Eco-Soderberg technology, dry Gas Treatment Centers (GTC) are being built. Implementation of Eco-Soderberg technology ensures achieving better environmental performance indicators as compared with older prebake technology.

95 % energy consumed by RUSAL's smelters is supplied by hydroelectric power plants; due to that specificity, greenhouse gas emissions from aluminium production are one of the lowest in the world.

In November, 2017 RUSAL launched new low carbon aluminium brand, *ALLOW*, which features specific direct and indirect emissions not exceeding 4 t CO₂/t of aluminium.

The inert anode technology is undergoing pilot testing at Krasnoyarsk aluminium smelter. Presently 1000 tonnes of aluminum have been produced at the pilot plant.

The aluminochloride technology developed by RUSAL for extracting alumina from high-silica raw materials has successfully passed mini plant tests. The technology consumption parameters have been confirmed, ensuring low cash cost (< 200 USD/t) of smelter grade alumina. An industrial pilot plant facility is currently being designed. The by-products of the process are value-added products, i.e. pseudoboehmite, high-purity alumina; waste generation is minimised by means of processing the silica residue into highly-profitable products (adsorbent, liquid glass, silicagel, etc.)

UC RUSAL owns a unique technology of comprehensive nepheline processing to produce alumina, soda products and cement that produces no waste. As part of process improvement the Company has developed a nepheline ore beneficiation technology via reverse flotation method. Result of the project is expansion of Achinsk refinery raw material base for 50 years, while retaining position of this refinery as the lowest cash cost alumina producer in the Company.

RUSAL has successfully completed research to create a technology for high-carbonate bauxite beneficiation to reduce the cash cost and increase the production capacity of the refineries that use Bayer-sintering method.

At Urals alumina refinery new digestion train has been commissioned with specific steam consumption by 25 % lower as compared with existing trains and increased alumina production by 170 ktpa.

Digital twins have been developed using SysCAD software at all alumina refineries, including unparalleled in the world, digital twins of the refineries that use sintering and Bayer-sintering processes.

Technologies for special aluminium hydroxide and special grade alumina are being developed, i.e. tests of production technology for superfine precipitated alumina trihydrate have been completed and at present the technology is at the stage of industrial implementation. The product can be used as an antipyrene in non-flammable compounds for cable insulation and sheathing, as well as for other purposes.

RUSAL is working on the following directions to enhance completeness of ore components utilization:

- Technology of scandium oxide recovery from red mud has been improved. New technical solutions have been tested at a pilot scale installation. Feasibility study for construction of an industrial unit for 3 000 kg Sc₂O₃/y is in progress.
- The Company has developed a process to extract gallium from aluminate liquors of its Bayer refineries. The production costs are 25 % lower as compared with the existing technologies.

RUSAL holds a leading position in bauxite residue utilisation – in 2017 the Company processed ~ 6 % of its red mud and about ~13 % of its nepheline mud produced by all Company's refineries (while average red mud utilization in the world amounts only to ~ 1.5-3 %).

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