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A Method of Processing Lead Containing Materials

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ABSTRACT: The production of lead from secondary raw materials plays an important role in the overall balance of its recycling and consumption. The increasing demand for lead has necessitated a greater involvement in the turnover of industrial products and industrial wastes of various industries, since the lead from sulfide raw material is not produced in the territory of Uzbekistan.

KEY WORDS: Production, Lead, Roasting - leaching - electric extraction, Pyro metallurgical, Hydrometallurgical, Accumulation, Gold, Silver.

I.INTRODUCTION

The production of zinc according to the classical scheme - "roasting - leaching - electric extraction" is accompanied by formation of lead sludge, which is currently not recycled accumulates in large volumes in temporary dumps, causing damage to the environment; they belong to the 1st class of danger and companies are forced to pay for the storage of this waste.
Technological and environmental disadvantages of pyro metallurgical extraction of lead from waste and industrial products determine the need to devise better ways for their complex processing. Foreign enterprises are conducting an active search for alternative technologies for the production of refined lead and its alloys with the use of hydrometallurgical and electrochemical techniques.

II. METHODOLOGY

The most promising hydrometallurgical methods of processing of lead cake with the use of complex agents, which provide selective removal of lead from industrial products and the possibility of electrochemical regeneration with receiving the cathode lead. Technology meets the modern environmental requirements, is completely enclosed by water and solid wastes can be integrated into the production cycle in lead-zinc enterprises. The advantages are: non toxicity of the solvent, carrying out technological processes at normal temperatures in reactors without acid-resistant lining.
In metallurgical plants there is an accumulation of lead containing materials, including electrostatic dust, lead, bismuth sludge from sulfuric acid plant smelter and lead residues form zinc plant. This leads to the overstocking of nonferrous metals costs in their warehousing and storage, deterioration of the environmental situation of the industrial zone of the plant. Plant, since 2001, scientific – research works are performed on processing these materials. However, to date there is not acceptable technology for the production.To solve this problem, the laboratory developed a technological scheme for processing stale lead-containing materials with acceptable technical and economic indicators, covering all available types of lead raw materials, including battery scrap. The final product of the processing is rough lead,

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production solutions, containing copper and zinc, electrolyte sludge, which are the raw material for the separation of gold, silver and bismuth.

The processing process consists of the following stages: - ammonia-soda leaching (ASL) and pulp filtration; - drying the cake to a moisture content of 5%, pelletizing or grinding, depending on the method of melting; - high-temperature (1100°C) smelting on rough lead in reflective, heated by natural gas or electric arc furnace operating in the mode of electrical resistance.

As an alternative way is low temperature alkaline melting under a layer of caustic soda; - electrolytic refining with the use of a solution of sulfamic acid as the electrolyte; - melting refined lead and pouring into ingots; - refining electrolyte slurries for the purpose of extraction of precious metals and bismuth; - processing of productive solutions from ASL to separate copper and zinc. The need is determined by ASL removal from the filter cake into a solution of copper and zinc and the transfer of lead sulfate to the carbonate, which is preferable as the alkaline and high temperature pipeline. Ammonia-soda processed cakes ASP lead and lead-bismuth cakes CSF together with CEF dust ratio dust: cakes 70:30 or 50:50. The ammonia-soda leaching tested in industrial conditions at the installation inventories in March 2007, the CEF dusts and showed satisfactory results as to quality of the cake (the lead content increased to 70%, copper, and zinc decreased to 0.2 and 2.0%, respectively), and filtration capacity of the pulp (moisture content 30%). Lead, precious metals, antimony, arsenic, bismuth, 95% remain in the filter cake in the oxide-carbonate form. Consumption ratios for ASP, tons per ton of dust were follows: - ammonia water, 25% - 0,9; - soda ash - 0,06; water - 1,0. The leaching process is carried out in a reactor with mechanical stirring, at a temperature of 60°C. It is necessary to create in the reactor a slight vacuum. The output of the mass of the filter cake is amounted to 0.6 by weight of the dust. The ratio of S:L in the leaching process was 1:2. The volume of production of a solution of 2.5 m^3 and it contains 7-10 and 70 g/l of copper and zinc, accordingly.

This requires the compliance with conditions: The mixing of with it's the pulp by compressed air is unacceptable due to the high volatility of ammonia and therefore significant losses. A complete cycle of operation of reactor to discharge of the filter was 5-6 h. Including the leaching time is 2 hours. At the same time, in 10 CC reactor can be loaded at least 3 tons of dust. In preparing the material for high temperature melting, preferably dosed to the wet cake of the estimated amount of slag-forming materials, mix, pass through a die with holes of 5–8mm and dried to a moisture content of not more than 5% before feeding into the melting furnace. In the case of alkaline fusion cake is dried, mixed with reducing agent and portions, at least assimilation, pre-molten caustic, feeding in the melt.

Consumption of caustic soda per ton of lead bullion is 0.7 tons.Due to the rather high cost of caustic and the lack of domestic production of it, a search was conducted for a technological process that excludes its use. As such a method, a so-called soda melting is proposed, which consists in blending the cake from leaching obtained by the above technology with a melt, slag-forming, reducing agent and its subsequent melting on rough lead in an existing electric arc or reflective furnace, at a temperature of 1100 ° C. Melting in an electric arc furnace is slightly different from the modes of its use in the smelting of lead developed by the ASP.

Consumption coefficients for melting converter dusts and dust-cake mixtures based on 1 tons mixture, from: dust of the mixture: - fluff, kHz 250–400 - quartz, kHz 200–100; - reducing agent, kHz 60–50. As a reducing agent, coal with a carbon content of 80–85% can be used. The melting time is one hour. In an arc furnace, a continuous melting process is possible, with periodic discharge of metal and slag. Lead recovery from cake is 90%. Slag contains of 1-2% lead, 0.5% copper, 5–6% zinc and is a vitreous mass that does not decompose during prolonged storage. Slag ratio 1. The obtained crude lead has the following composition,%: Ag - 0.04, As - 0.04, Bi - 1.09, Ca - 0.004, Cu - 0.05, Mg - 0.001, Na - 0.005, Sb - 1.06, Te - 0.07, Zn - 0.001.

When processing lead-bismuth cakes, rough lead may contain significant amounts of gold, which will also be concentrated in the metal. Rough lead is poured into anodes for elektrorefining or ingots for further refining the alkaline way. To obtain the commodity of lead and the allocation of precious metals, roughing the lead as from paceway and alkaline melts is subjected to refining from impurities. Known methods of refining, are more acceptable to the plant, is an electrolytic, for the following reasons: - there is spare capacity of electrolysis as ALF and inventories;

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- there are skilled electrolysis; -in one operation is cleaned from all impurities; - all the materials are used as domestic production. Derivable lead corresponds the brand CO.
Sulfamic acid the electrolyte is their own making, one of the two known methods: - autoclave – a mixture of gaseous NH_3 and SO_3; - the reaction – the influence of concentrated sulphuric acid on urea. The flow of the electrolyte is 20 g in 1 t of refined lead. The process of electrolysis as applied to the conditions of the works developed by the teams ALF, CSF and Central research laboratory.

III. CONCLUSION

Electrolytic slimes containing gold, silver, bismuth is processed with a view to their allocation to the individual products by the known technology, with some refinement with regard to the conditions of the plant. Copper from solutions after the ASL stands by cementation on zinc. Zinc precipitates from the solution after cementation by blowing sulfur dioxide gas, the precipitate is filtered out and transmitted to the plant leaching ALF. The economic effect of the project is not calculated in respect of price volatility, but given the selection of all metals, at least, will not be unprofitable.

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