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Lead-acid Batteries Recycling

Lead-acid batteries have been widely used as autonomous chemical current sources for nearly 150 years. Today lead-acid batteries firmly take the first place among all other kinds of chemical current sources and there are still no alternatives to their use in vehicles and other fields.

At the same time exhausted batteries (service life up to 3 years) are ecologically dangerous. The reason for this lies in the toxicity of lead contained in batteries (up to 60% from weight) and chemical aggressivity of acid electrolyte – sulfuric acid solution. Unfavorable ecological situation forces to pay special attention to the problem of millions failed batteries utilization and take measures to prevent harmful effect on the environment and public health.

In Ukraine the majority of exhausted batteries are taken abroad for recycling. So there is a need for modern plants for the lead-acid batteries utilization. As a provider of technologies and equipment we consider the popular all over the world Italian company Engitec Technologies.

Technological process of recycling begins with the discharge, collection and filtration of the electrolyte. Batteries are thrown off by the crane into a concrete pit for depressurization. The pit opens periodically to collect batteries released from the electrolyte. The electrolyte is collected in the closed assembly by hermetic chutes. The electrolyte is pumped into the electrolyte storage tank through a filter trapping solid particles from it.

Batteries released from the electrolyte are transferred by the crane to the receiver. Waste batteries come to the conveyer belt that loads them into the crusher. The magnetic separator is mounted over the conveyer for the metal contamination separation. The crusher grinds waste batteries into pieces of 50-80 mm. They are loaded into the separator where are washed by the flow of circulating water to separate the lead paste. The lead paste consists of lead sulfate, lead oxides, and particles of metallic lead. The paste is removed from the separator and collected in a tank where is compacted. In the process of its obtaining plastic, polypropylene, metal fractions are discharged.

To remove sulfuric acid vapour and particles similar to dust a system of the sanitary ware suction is provided. The air of sanitary ware suction passes through the gas cleaner where it is washed by the filtrate flow.

At a certain ratio components required for melting are fed into the loading machine. It loads the obtained charge into the rotary furnace. Waste flue gases and

sanitary ware gases as well get to the precipitating dust chamber and bag filter by gas ducts.

Melted lead is poured into the furnaces where hardens. Then it is discharged in the refining section. The resulting lead melt and its alloys are pumped to the casting machine to obtain lead ingots and its alloys.

The resulting slag is checked for lead and then is taken to the dump.

The ultimate product is soft lead with the content of Pb>99,985%, as well as lead and lead alloys.

Table 1 – Engineering-and-economic performance of the production

Inputs name	Material characteristic and energy supply parameters	Measurement unit	Yearly consumption
Lead-acid batteries waste	Electrolyte with the content of H_2SO_4 <15% -20+25% weight; $PbSO_4$ -20+30% weight; PbO_x -10+15% weight; Metal lattices -20+30% weight	t	26000

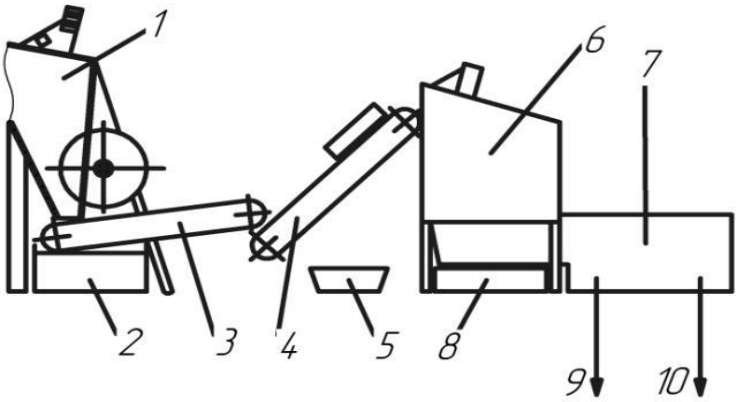

Fig. 1 – Schematic diagram of the operating installation: 1 – products receiver; 2 – tank for acid collection; 3 – vibrational unloader of damaged products; 4 – conveyer to move them to crush; 5 – magnetic separator; 6 – crusher; 7 – installation of hydrodynamic separation of recyclable battery fractions; 8 – tank for lead paste collection; 9 – polypropylene unloading; 10 – output of lead ingots and its alloys.

Thereby, the given schematic diagram allows to utilize batteries by the electrolyte neutralization and the remelting of the lead recycling.

Literature:

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