ECO-TECHNOLOGICAL PROCEDURE OF THE WASTE WATER AND SLUDGE TREATMENT OF THE GALVANIC PROCESS

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The subject of the paper is eco-technological procedure of the wast water treatment of galvanic process with the following processing of sludge generated during the conventional purification (CN- oxidation, Cr6+ reduction, chemical precipitation of the other metals) of the waste water.

The galvanic industry includes degreasing, galvanizing, burnishing and pickling of materials. Depending on the kind and the size of the plant, not all steps are used in one company. The kind of waste water treatment depends on the specialization of the plant, the processes used and the amount of the processed water . Below, we introduce several waste water treatment methods in galvanic industries.

Galvanic waste water haves to be treated in two ways: on one hand the used waters are reclaimed and recycled for reducing of water consumption, and on the other hand to get some useful substances contained in the waste water.

There are many treatment methods, which function by various chemical and physical means or in their combinations. All methods are sensitive to heavy metals, oil and grease in varying degrees. The methods such as ultrafiltration can handle suspended solids better than other methods such as reverse osmosis. Physical processes of suspended solids treatmant either by means of their settling out (sedimentation) or by their floating are rather simple. Also we can use stirring or agitating to cause particles to contact each other and stick together without or with chemical additives (flocculation). Particle flotating can be coused by dissolved air under pressure or under vacuum conditions (dissolved air flotation). Chemical processes include precipitation, flocculation, neutralization and solidification. Membrane processes include reverse osmosis and ultrafiltration and other filtration systems.

The second trend of the paper is the recovery of various useful metals and the sludge treatment as the dangerous waste to get useful product (glass-ceramics), with eliminating of the generation of the dangerous and harmful materials in the environment. The second trend is also connected with transform chemical active matters (Cu^{2+}, Cr^{3+}, Cd^{2+}, Ni^{2+}, Pb^{2+}, Zn^{2+}) using the phase and chemical transformation into very stable structure where the polutants can not be activated even under critical conditions such as high temperature, influence of acids and alkalies, etc. Among basic treating possibilities of galvanic sludge are: stabilisation, pyrometallurgical, hydrometallurgical, biohydrometallurgical and combined technologies.

Galvanic sludge is formed at electroplating plants as a result of precipitation of metals in waste water and from the electrolyte used. Galvanic sludge consists of metals used for surface treatment like Cu, Ni, Cr, Cd, Sn, Zn, Ag, Au, Pb and bearing metals like Al, Fe, Mn and substances used for precipitation process, as Ca and Na. The galvanic sludge besides heavy metals like copper, zinc and nickel in the form of hydroxides (oxihydroxides) contains also various impurities like $CaSO_4$, SiO_2, $CaCO_3$, also cyanides, sulphides, fluorides, tenzides and oils. This complex sludge is considered to be hazardous waste, but on the other hand it is a valuable source of various metals like copper, zinc, nickel, cadmium, gold, silver etc. The amount of metals present in the sludge depends on with galvanising technology applied and on the surface area of the sludge. Total volume of the sludge depends on the composition of the galvanising baths, on wastewater concentration and on type of reagents used.

Stabilizing technologies provide an environmentally friendly solution, but without exploitation of the secondary raw materials potential. The purpose of the stabilisation process is the immobilisation of contaminants in the solid matrix of stabilised material. Hydrometallurgical method for treating galvanic sludge is based on leaching in acid or alkaline solutions followed by selective separation of

metals from these solutions by means of solvent extraction methods, electrochemical methods as well as by appropriate precipitation processes. Biohydrometallurgical recovery of non-ferrous metals is based on utilisation of bacteria in bioleaching process. This method combines oxidation effect of trivalent Fe in sulphuric acid and biooxidation of bivalent Fe by the action of bacteria Thiobacillus ferrooxidans during leaching process.

The problem of galvanic sludge treatment is very actual and there is a tendency to find the most effective method for treating and utilising each valuable component from it.