

COMMUNICATION

JERZY DUDEK, EUGENIUSZ SKIBA*, ADAM PONIKOWSKI**

LABORATORY INVESTIGATIONS ON THE IMPROVEMENT OF PURIFICATION DEGREE OF INDUSTRIAL WASTES FROM COPPER MILLS

Industrial wastes from copper mills treated before being drained to a receiver are still highly polluted. Having in mind the protection of the receiver as well as the possible reuse of most wastes in technological cycles, laboratory investigations on the development of an effective treatment method have been undertaken.

The wastes investigated were characterized by the following indices of pollution: pH — 5.9–7.48, conductivity — 825–1310 S/cm², chlorides — 70–124 mg Cl⁻/dm³, sulphates — 80–129 mg SO₄⁻²/dm³, permanganate value — 21–35 mg O₂/dm³, COD — 124–236 mg O₂/dm³, dissolved compounds — 576–717 mg/dm³, total suspensions — 102–150 mg/dm³, dry weight — 694–842 mg/dm³, total hardness 4.6–16.3°n, heavy metals (iron, copper, zinc, lead, nickel) totally — 5.5–18.58 mg/dm³.

In the course of investigation an effective and economic coagulant (FeSO₄·7H₂O) has been chosen. Its dose ranged within 100–150 mg/dm³. In treated wastes the pH was corrected up to 9–9.5 by applying 50–150 mg/dm³ of milk of lime. After treatment the wastes were characterized by the following indices of pollution: pH — 8.7–9.05, conductivity — 931–1440 S/cm², chlorides — 71–142 Cl⁻/dm³, permanganate value — 5.2–8.3 mg O₂/dm³, COD — 12.63–17.4 mg O₂/dm³, total dissolved compounds — 480–592 mg/dm³, total suspensions — 5.30 mg/dm³, total dry weight — 576–714 mg/dm³, total hardness — 7.5–16.1°n, heavy metals (iron, copper, zinc, lead, nickel) totally — 0.6–0.7 mg/dm³.

Sludge formed during coagulation process constituted about 1.5% of the amount of wastes being treated. The sludge was characterized by the following mean indices: hydration — 98.38%, resistivity — 37·10⁸ s²/g, total content of heavy metals — 7435 mg/kg of dry sludge. Further investigations allowed to state that the dose of coagulant (FeSO₄·7H₂O) could be reduced to 80 mg/dm³ (on the average) if the process of coagulation was combined with that of flocculation by addition of a flocculant. It has been stated that Rokrysol WF-1 given in dosage of 2 mg/dm³ of wastes is the most appropriate of all the flocculants examined. It not only allows to reduce the dosage of basic coagulant, but also it improves the degree of purification. This improvement was particularly well pronounced in reduction of the following indices: total suspended solids to which 0–4 mg/dm³, permanganate value — to 2–4 mg O₂/dm³, and heavy metals content — to 0.1–0.3 mg/dm³.

Results of laboratory investigations have shown that the examined wastes can be purified to the degree allowing their reuse in technological cycles. This, in turn will allow to reduce the amounts of wastes drained to receivers and of water uptaken. In the nearest time a new series of investigations will be performed on a model station in order to confirm laboratory results. Since these investigations are to be carried out under dynamic conditions they will provide the data indispensable in design of waste treatment plant and help to develop an effective technology of sludge neutralization.

* Establishment of Copper Design and Research (CUPRUM), Wrocław, Poland.

** IMG0, Wrocław, Poland.