

Treatment of metal finishing effluents by the electroflotation technique

A. Khelifa*, S. Moulay, A.W. Naceur

*Département de Chimie Industrielle, Faculté des Sciences de L'Ingénieur, Université Saâd Dahlab de Blida,
B.P. 270, Route de Soumâa, 09000 Blida, Algeria
Tel./Fax: +213 (25) 43 36 31; email: akhelifa@mail.univ-blida.dz*

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Abstract

Metal finishing plants in the vicinity of the Mazafran River continuously discharge a substantial amount of wastewater. This water disposal contains an appreciable quantity of heavy metals such as nickel, copper, zinc, cobalt, etc. The river, located west of Algiers Bay, ends at the Mediterranean Sea. The techniques used to depress the pollution caused by the effluents of the metal finishing industry are costly and not easily controllable. Electroflotation (EF) serves as an efficient and promising alternative due to its simplicity and cost-effectiveness. In the present work EF was used to reduce the concentrations of copper and nickel found in real wastewater. The effects of the following parameters were examined: current density, pH, heavy metal concentration, supporting electrolyte concentration, and the nature of the electrodes. By optimizing the operation, heavy metal removal reached 98–99%, and maintained final and global concentration to a value lower than the World Health Organization standard, which is 1 mg/L for nickel and copper.

Keywords: Electroflotation; Wastewater treatment; Electroplating effluents; Heavy metals

1. Introduction

Metal finishing industries are severely polluting the environment by their disposals of bath and rinse wastewater [1]. These disposals unfortunately contain toxic species such as heavy metals whose increased concentrations in the human body may cause some significant health-related problems in the long run [2,3].

The conventional techniques of purification such as precipitation are not encouraging as the toxic species concentrations can be, at best, three to ten times higher than the maximum permissible concentration [4]; that is, 1–5 mg/L of metallic ions and 5–20 mg/L of suspended matter. Besides the use of acids and bases in view of increasing the salt concentration in treated solutions, these treatment techniques require skilled workers. Galvanoplasty plants are implemented in the vicinity of the Mazafran River located west of Algiers

*Corresponding author.