

## **Characterization and Treatability of a Metal Finishing Industry Wastewaters**

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### **Extended Abstract**

Metal finishing industry is one of the common activities worldwide. The wastewaters originating from the industry are complex containing a number of pollutants including heavy metals, phosphates, suspended solids, oil and grease and cyanide. Many of these parameters are toxic and included in the priority pollutants lists. Although treatment systems applicable to metal finishing wastewaters are well defined problems may arise unless a case-based evaluation is made due to the complex structure of wastewaters (Tunay et al., 2004). Another important point is in-plant control and to determine flow segregation or combination for the parameters requiring separate treatment. Finally, as long as the industry of concern is running, best results can be ensured by conducting treatability experiments. In this paper, results of a wastewater characterization and treatability study carried out for a metal finishing industry is presented.

The industry is located in Istanbul, Turkey and manufactures parts for bicycles and motorcycles. The main manufacturing processes are: axis cutting, axis coating, cylinder coating, welding cooling and painting. These processes involve the use of unit operations of degreasing, stain removal, surface activation, phosphating, painting, metal plating and passivating. These processes create both batch and continuous wastewaters. Batch wastewaters are mainly from intermittent bath dumps. Continuous wastewaters are washing and rinsing streams. The ratio of batch wastewaters to total wastewaters is less than 5 %, but their contribution to the waste strength is significant. The amount of total wastewater is around 100 m<sup>3</sup>/day.

Wastewater characterization was based on a treatability oriented approach; the need for separation or combination of flows and application of pretreatment such as oil removal or chromium reduction prior to hydroxide precipitation (Kerestecioğlu et al.,1994). Main pollutant parameters of the metal finishing industry wastewaters except cyanide which was not used in the manufacturing processes were considered for wastewater characterization. Wastewater characterization was made by preparing composite samples. One composite sample represented a flow ratio based continuous flows (Composite I). Another sample was prepared as a flow ratio based mixture of batch and continuous streams on the monthly average basis (Composite II). In both samples, oil and grease and phosphate concentrations were below 30 mg/L, suspended solids concentrations were below 100 mg/l. Chromium concentration was 20 mg/L for Composite I while, exceeded 1000 mg/L in the Composite II. Concentration of other heavy metals (Cu, Zn, Pb, Ni and Cd) were around 1 mg/l for Composite I and varied between 0.4-60 mg/L for Composite II.

Treatability experiments were planned considering the wastewater characterization. No separate oil removal was needed. For both composite samples a treatment sequence of chromium reduction and hydroxide precipitation was adopted. Bench scale experiments were conducted for chromium reduction at pH 2 using sodium bisulfite and hydroxide precipitation was realized using lime to precipitate phosphate together with metal hydroxides. Carbonate was added to effectively precipitate the lead ions. The optimum pH of cadmium for which the most stringent discharge standard was applied was taken as the basis in the application of hydroxide precipitation. The effluent contained chromium and lead concentrations below 0.5 mg/L while concentration of all other metals were below 0.1 mg/L. Phosphate, oil and grease and suspended solids concentrations in the effluent satisfied direct discharge standards.

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