

Pre-Treatment of Mixed Agro-Food Industrial Wastewaters Using Advanced Chemical Oxidation Process

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ABSTRACT

Nablus municipality faces techno-economic and environmental challenges in finding environmentally sound and economically feasible alternatives for agro-food industrial wastewater treatment. The dairy and slaughterhouse lack pre-treatment systems, hence discharging industrial wastewater into Wadi Zaimer and Wadi Sajour without prior treatment. Non-compliance of agro-food industries with Cabinet Resolution (CR 16/2013) poses environmental and health risks, associated with increased annual operational expenditures for the industries and municipality. This research study aims at finding a technically reliable treatment option for the reduction of organic and solids loads from mixed agro-food industrial wastewaters (dairy and slaughterhouse) of Nablus city. For this purpose, bench scale Jar tests using an advanced oxidation process (AOP) were performed as a pretreatment stage. The classical Fenton's process was applied for mixed agro-food wastewater samples with initial COD values ranged between 15400 and 18200 mg/l. Initial tests revealed unsatisfactory results when Fenton reaction applied directly without prior treatment of mixed industrial wastewater. Hence, Fenton experiments preceded integration of partial treatment trials. Partial treatments of mixed samples included: sample "A" coagulant (FeCl₃.6H₂O) added, sample "B" settling (2h) allowed and the sample "C" lime Ca(OH)₂ flocculated. Obtained results showed that optimization of Fenton's process was reached by partial treatment of mixed industrial wastewater. Compared with other partial treatments, sample (C), Fenton's process lime preceded, was the most effective in the removal of organic (89% COD; 80% TKN) and inorganic loads (91% TSS; 62% TS) under H₂O₂/COD (w/w ratio 2:1), H₂O₂/Fe⁺² (w/w ratio 10:1) and acidic conditions (pH =3). Finally, our results comply with CR 16/2013; this encourages agro-food industries install onsite Fenton-based peroxidation systems to get connection permits to the public sewage networks.

Keywords: advanced oxidation process; mixed agro-food industrial wastewater; Cabinet Resolution (CR 16/2013); Fenton reaction; Wadi Zaimer

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