

10th World Congress and Expo on Recycling

July 26-27, 2018 | Amsterdam, Netherlands

Evaluation of sonication process in vegetable tannery wastewater treatment

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The tanning industry in Italy represents a significant contribution to the European economy. At the same time, it is well known that this industry generates significant amounts of contaminated wastewater. Vegetable tannery wastewater contains high concentrations of organic matter (COD) with a significant percentage of recalcitrant organic compounds. Vegetable tannery wastewater shows several drawbacks due to the complexity of the chemical composition. Contaminants must be removed to avoid significant environmental impacts. In another hand, activated sludge processes are key technologies in wastewater treatment. These biological processes produce massive amounts of waste activated sludge (WAS) or otherwise bio-solids. Mechanical, thermal, and/or chemical WAS conditioning techniques have been proposed to reduce the sludge charge. Among them, WAS treatments; the pre-treatment with sonication is one of the most innovative processes. Primary attention is focused on the effect of high-frequency sonication on reducing organic matter with or without using H₂O₂ and aeration. The parameters affecting the removal of the organic matter (COD) and soluble COD (SCOD) and total nitrogen (TN) and total organic carbon (TOC) were also analyzed and compared. Particular attention is then made on how the presence of H₂O₂, affects the performance of the process, and how it affects the combined sonication and biological processes. In other words, the study focuses on the effect of Sonolysis on waste activated sludge solubilization and anaerobic biodegradability of vegetable tannery wastewater and primary sludge of a plant treating tannery wastewater, located in Santa Croce (Tuscany, Italy). The results obtained from a pilot scale study developed in the Tannery wastewater treatment plant (Cuoio-depur). In the test carried out, the combination of a sonication pre-treatment with using H₂O₂ showed satisfactory results regarding reduction COD and SCOD on vegetable tannery wastewater and primary sludge for recovery and reuse in the tannery treatment cycle. The sonication pre-treatment was able to remove approx. 25% of COD, and SCOD in wastewater and more than 40% of reducing COD and 18% increment of SCOD in the primary sludge of vegetable tannery wastewater. Moreover, the effect of sonication with using H₂O₂ in total suspended solid (TSS) and volatile suspended solid (VSS) respectively was 35% and 30%. In another hand, the results showed 27% reduction of total organic carbon (TOC) in the primary sludge of vegetable tannery wastewater.

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