Upgrading of Ceramic Wastewater Treatment for Reuse

Submitted By
Ahmed Ahmed Ahmed Elserwy

B. Sc., of Science (Chemistry), Faculty of Science Ain Shams University, 1993

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Science

Department of Environmental Basic Science
Institute of Environmental Studies& Research

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Ahmed Ahmed Elserwy

Abstract

In this study, upgrading of ceramic wastewater treatment for reuse was performed using different physical and physico-chemical processes. Additional pre-settling as a physical process was used to partially-treated ceramic wastewater. Coagulation-flocculation as physico-chemical processes by using different coagulants was carried out to treat ceramic wastewater. This wastewater was also treated using polyaluminum chloride as dual coagulant/ flocculent and coagulant aid. Also, ferric chloride was used as coagulant and anionic polyelectrolytes as coagulant aids. The overall enhancement of the treatment process was studied by adding pre-settling stage; then coagulation/-flocculation process was applied using ferric chloride solution; followed by anionic polyelectrolyte. A sand filter unit was added as a tertiary treatment step.

Technical assessment of the performance of the running wastewater treatment process of existing plant was carried out by analyzing TSS, COD and BOD for the raw industrial wastewater to detect the compliance/non of discharging limits onto the city sewerage network. Analyses of the raw wastewater showed that the concentration of suspended solids was as high as 18173 mg/l, indicated that it was exceeding the trigger levels of discharging wastewater on the city sewerage network.

Coagulation/ flocculation and precipitation studies were performed using different coagulants in a conventional Jar-test apparatus. Alum, ferric chloride and polyaluminum chloride were used as coagulants, respectively. A sand filter unit was added as tertiary stage at the end of treatment processes.

Sand filtration after coagulation– flocculation using alum coagulant enhances TSS, COD and BOD_5 % removal to 97.8, 89.7 and 86.6, respectively.

Additional presettling of raw wastewater to coagulation with alum and polymer followed by sand filtration achieved the good removal efficiency for all measured parameters so that the effluent wastewater was comply to be discharged to marine environment additional treatment is required to be reused for unrestricted irrigation, and to be recycled in the factory.

The optimal condition was obtained at the dosage 285 mg/l ferric chloride and polymer followed by sand filtration provide the TSS, COD & BOD removal efficiency of 98.9%,93.7& 90.6, respectively..

The optimal removal efficiency of pollutants from ceramic wastewater was obtained when using presettling then coagulation with ferric chloride and polyacrylamide followed by sand filtration achieved the highest removal efficiency for all parameters, so that the treated wastewater can reused in unrestricted irrigation after chorine addition as disinfectant, and / or to be recycled in the factory.

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Abbreviation List

Abbreviation	Illustration
BC	Before Christ
BOD	Biochemical oxygen demand
ºC	Centigrade
COD	Chemical oxygen demand
EC	Electrical conductivity
m^3 /d	Cubic meter per day
$m^3/m^2/d$	Cubic meter per square meter per day
mg/l	Milligram per liter
ml /l	Milliliter per liter
min	Minute
PAC	Polyaluminum chloride
ppm	Part per million
% R	Percentage removal
rpm	Recycle per minute
RWW	Raw wastewater
SS	Suspended solids
TDS	Total dissolved solids
TS	Total solids
TSS	Total suspended solids
uS/cm	Micro siemens Per Centimeter
Z_p	Zeta potential

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