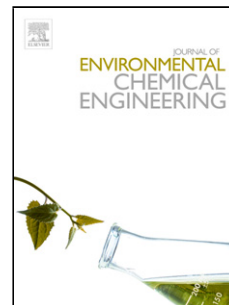


## Accepted Manuscript

Title: Optimization of column distillation in a wastewater treatment plant

Author: Grazia Leonzio

PII: S2213-3437(17)30552-3  
DOI: <https://doi.org/10.1016/j.jece.2017.10.051>  
Reference: JECE 1961



To appear in:

Received date: 19-7-2017  
Revised date: 14-10-2017  
Accepted date: 25-10-2017

Please cite this article as: Grazia Leonzio, Optimization of column distillation in a wastewater treatment plant, Journal of Environmental Chemical Engineering <https://doi.org/10.1016/j.jece.2017.10.051>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Optimization of column distillation in a wastewater treatment plant

Grazia Leonzio<sup>a</sup>

<sup>a</sup>Department of Industrial and Information Engineering and Economics, University of L'Aquila, L'Aquila, Italy

email: [grazia.leonzio@virgilio.it](mailto:grazia.leonzio@virgilio.it); [grazia.leonzio@graduate.univaq.it](mailto:grazia.leonzio@graduate.univaq.it)

### Abstract

In this research, a study about a wastewater treatment plant, treating industrial wastes hazardous and not, is carried out. In the plant, the biological, the chemical/physical and the distillation/evaporation sections are present. Experimental analysis and process simulations of the plant are carried out to show the important role of column distillation. In literature, works about the modeling with ANOVA and simulations of this kind of wastewater treatment plant are not present. Analysis of COD and water content are carried out in laboratory testes while a process simulator is used to simulate the plant. Results show that the feed of column distillation is excessive and diluted, decreasing the efficiency of the process. A new configuration of the plant can be developed and analyzed: only the evaporated of the pre-heater are sent to the column, while the other distillates are sent to the biological section. A sensitivity analysis allows to find, the optimal operating conditions for the distillation section: temperature of feed 353 K, steam flow rate 155 kg/h, feed flow rate 2500 kg/h, reflux ratio 3.6, COD in the residue 28 g/l, solvents in residue equal to 5 % w/w and distillate with 6 % w/w of water. Compared to traditional scheme, the analyzed solution allows to save 33 k€/year for fuel producing the steam. Results of ANOVA analysis shows that the temperature of feed and the reflux ratio are the most significant factors on the distillation. Future researches should verify the obtained results in the real plant.

**Keywords:** Distillation column, Process analysis, ANOVA analysis, Wastewater treatment plant, Optimization.

### Nomenclature

WWTP: Wastewater treatment plants

COD: Carbon oxygen demand

MD: Membrane distillation

D60: Pre-heater of WWTP

D61: Reboiler of WWTP

D63: Vessel of WWTP

D200: Vessel of WWTP

D201: Vessel of WWTP

D11: Vessel of WWTP

Download English Version:

<https://daneshyari.com/en/article/6664190>

Download Persian Version:

<https://daneshyari.com/article/6664190>

[Daneshyari.com](https://daneshyari.com)