



# EVALUATION OF SURFACTANT REMOVAL EFFICIENCY IN DIFFERENT MUNICIPAL WWTPS IN ROMANIA

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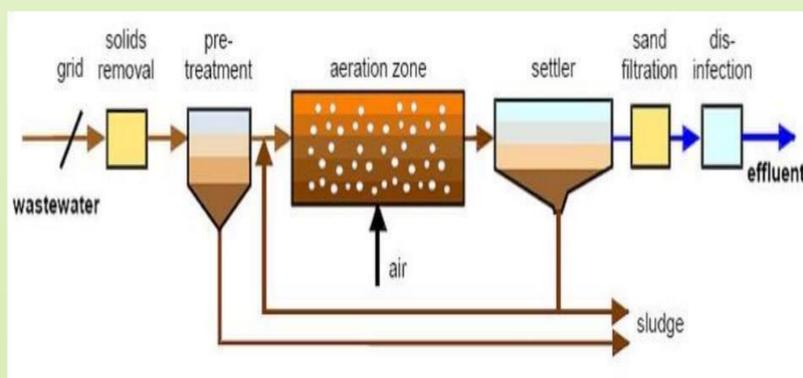
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## Introduction

Due the recent crisis of SARS-COVID-19 during 2020, the sales of cleaning and household products spiked up to 461% reported to last year which conducts to an increase in sewage systems of various inorganic and organic pollutants, including surfactants. Although the surfactants removal from influents of wastewater treatment plants (WWTPs) exceeded 80%, but their elimination is not only due to the biological treatment processes, but also to their adsorption on the activated sludge flakes. The accumulation of surfactants can cause malfunction of WWTPs by affecting several treatment processes (oxygen diffusion, foaming, biodegradation of organic compounds). This study presents results focused on operational efficiency of municipal WWTP's in terms of anionic surfactants removal.

## Materials and Methods

The detection of anionic surfactants concentrations from the influent and effluent samples was quantified based on methylene blue active substance indicator (MBAS), according to the Romanian standard (SR EN 903:2003). The concentration of anionic surfactants was measured spectrophotometrically, using the equipment Specord BU 205 (Analytic Jena, Germany).



*The treatment process of the activated sludge in a WWTP*

## Results and Discussion

Wastewater samples were collected from the influent and effluent of the municipal WWTP's located in different cities of Romania, in two different seasons (spring and summer 2020).

The removal of anionic surfactants was quantified by measuring their concentration in the influents and effluents of municipal WWTPs.

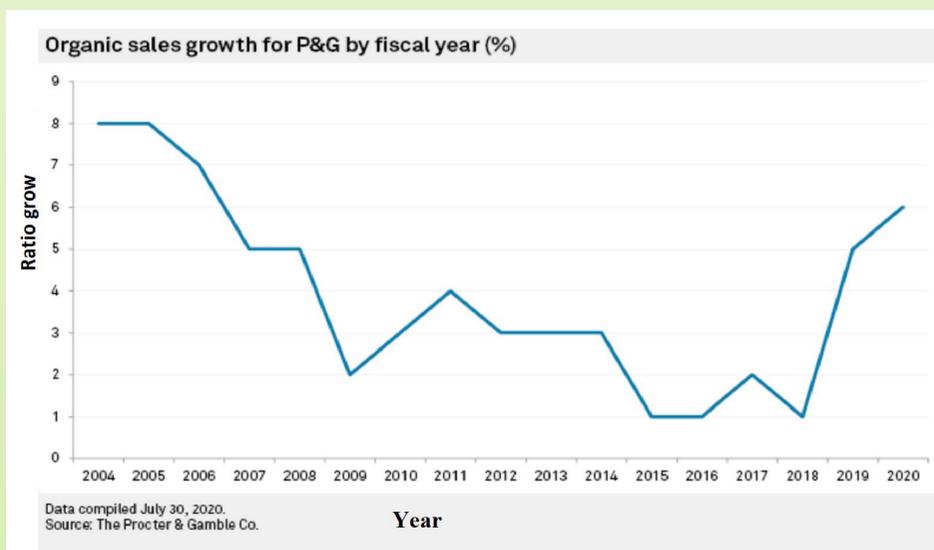
*Concentration and removal efficiency of anionic surfactants in influents and effluents of WWTPs*

Municipal WWTPs	Period of analysis	Anionic surfactants		
		Influent (mg/L)	Effluent (mg/L)	Removal efficiency (%)
Iasi	Spring	0.49	<0.1	80
	Summer	0.72	0.26	64
Galati	Spring	0.69	<0.1	86
	Summer	1.86	0.33	82
Bucharest	Spring	1.85	<0.1	95
	Summer	3.60	0.19	95
Targoviste	Spring	1.65	<0.1	94
	Summer	1.44	<0.1	93
Cluj	Spring	1.42	<0.1	93
	Summer	1.99	<0.1	95

In influents, the concentration of anionic surfactants varied from 0.49 to 3.60 mg/l (average of 1.52 mg/l), while effluents concentration were below the limit of quantification method (<0.1 mg/l) with several exceptions Iasi-Summer- 0.26mg/L, Galati-Summer- 0.33mg/L and Bucharest-Summer- 0.19mg/l).

The concentration of anionic surfactants had an increase in the Summer time related to Spring. That can be linked to the actual situation of pandemic SARS COVID-19 crisis and overuse of disinfectants and cleaning products and also the intensive washing procedures during this season. According to the Procter and Gamble Co. the uses of cleaning products had an increase in 2020(6%), related to 2018(1%).

*Procter & Gamble Co. report of cleaning products sales during years*



The monitoring study regarding the removal of anionic surfactants indicated that their removal efficiency is relatively high, exceeded 80%, with one exception, registered in July at the WWTP of Iasi (64%).

The legal regulations regarding the concentration of surface active compounds (anionic) are addressed in the Government Decision no. 352/2005 (norms regarding wastewaters discharge conditions in WWTPs and the conditions of wastewater discharge in the aquatic environment): < 25mg/L in the WWTP influent and < 0.5mg/L in the WWTP effluent. The obtained results of our study pointed out the efficient removal of anionic surfactants during the treatment process realized within municipal WWTP's from Romania and the limit values for their disposal in natural receptors are fully respected.

## Conclusions

The highest concentration of anionic surfactants was quantified in Bucharest WWTP( Summer– 3.60 mg/l) and can be related to the actual situation of pandemic SARS COVID-19 crisis due the intensive sales and uses of cleaning products.

The removal efficiency of anionic surfactants from the influents is relatively high (> 80%), with one exception at the WWTP of Iasi in July (64 %), but this exception fulfill the legal Romania regulation regarding the concentration of surface active compounds (< 0.5 mg/L) allowed for discharge into the natural receptor.

The monitoring study of the anionic surfactants variation in influents and effluents of WWTPs will be extended for at least 1 year.

## Acknowledgments

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