WASTEWATER ASSESSMENT IN GALATZ CITY (ROMANIA) DURING 2015-2016

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Abstract

Due to the industrialization and urbanization a great quantity of wastewater is produced every day. It is important to monitor the wastewater quality and to determine if it is safe to discharge it in to the environment. In this study, wastewater quality in Galatz city, from Romania, was evaluated. The wastewater generally comes from domestic activities and from industry. We were monitored wastewater which enters in the treatment station of the city. In order to monitor the wastewater quality, some physical and chemical parameters were determined according to standard methods. The analyzed chemical parameters were: ammonium (mg/l), total nitrogen (mg/l), sulphides and hydrogen sulphide (mg/l), total phosphorus, total dispersed solids (TDS), total solids in suspension (TSS)(mg/l), chemical oxygen demand (COD)(mg O_2/l) and pH. As physical parameters was studied only conductivity. These data were collected during February 2015–February 2016. The physico-chemical parameters were determinated each month during this period.

Key words: *monitoring, wastewater, physical parameters, chemical parameters, allowable values, quality indicators*

Introduction

The industrial development that occurred in Romania contributed to the increase in the quantity and variety of waste. These wastes from domestic and industrial activities can significantly affect human health (Frosch, 1996), the fauna and flora (Zamfir, 1998).

In this study we are interested in waste water quality in Galatz, an important city from Romania. Wastewater is water that has been affected in quality by anthropogenic influence. Industry, agriculture and domestic residences produce a wide range of waste which is discharged through the sewer system into natural receivers (rivers, lakes, seas), with or without prior treatment (Sablivoschi and Horaicu, 2009). The effluents usually contain large quantities of total dispersed solids (TDS), several chemical forms of nitrogen, phosphorus, sulphides, fats, proteins, chlorine, other kinds of organic matter, etc. (Ghimpusan et al., 2017). Wastewater quality can be assessed by analyzing the physical, chemical and biological parameters (Visan, 2000). According to the Council Directive

DOI: 10.6092/issn.2281-4485/7323

91/271/EEC (European Commission, 1991), the wastewater must be treated in treatment plants so that the effluent does not affect the nature.
Our interest was to assess the wastewater from the Galatz city. For monitoring the wastewater quality we analyzed several chemical and physical parameters such as: ammonium (mg/l), total nitrogen (mg/l), sulphides and hydrogen sulphide (mg/l), total phosphorus, Total dispersed solids (TDS) and Total solids in suspension (TSS) (mg/l), the chemical oxigen demand (COD) (mg O_2/l), pH and conductivity.

Experimental details

Contaminated water samples were taken at the entrance of the town treatment plant of Galatz. It is located on the Ring Road of Galatz. Monitoring was conducted from February 2015 to February 2016. Within this station is performed only mechanical treatment of these waters which will be discharged into Siret River. Starting March 2016 was started the biological treatment of these waters. The measured physico-chemical parameters were determined monthly during the monitoring period.
The potassium dichromate method was used to determine the chemical oxygen demand (CDOCr) (USEPA, 1978). The sulfur content in wastewater was conducted by iodometric method (SR7510/1997). This method determines sulphides in three forms: total sulfur, soluble sulfur in water and undissociated hydrogen sulfide. At the same time we determined the amount of sulfides using an UV-VIS spectrophotometer. The determination of phosphorus and nitrogen was also performed using a UV-Vis spectrophotometer. Determination of the suspended solids was determined by weighing. The effluent was vacuum filtered with a 0.45 micrometer paper. The paper was weighed before and after filtration. Drying was carried out at 105 Celsius degrees.

Results and discussion

Chemical oxygen demand (COD) is a measure of the amount of the organics and inorganic chemicals to consume oxygen during the decomposition respectively the oxidation. Figure 1 presents the CODCr indicator variation during the studied period. The parameter values ranged from 105 mg / l to 255 mg / l.
Usually in the treatment plants this indicator may be reduced by 70-90%. In other words could be reduced within the limits permitted by Romanian law HG nr.188/2002 and Council Directive 91/271/EEC. The permissible value under these laws is 125 mg/l.
COD values above the allowable values were recorded only in February, May, June and September. These increases can be related to the presence of large amounts of ammonium (Figure 4). Higher COD levels mean also a great amount of organic substances that can be oxidized.
In the survey period the indicators: sulphide and hydrogen sulfide had values less than 0.28 mg / l (Figure 2). According to the Romanian law, the permissible value after waste water treatment must be 1 mg /l.
During summer, total nitrogen had high values of 37-40 mg/l (Figure 3).

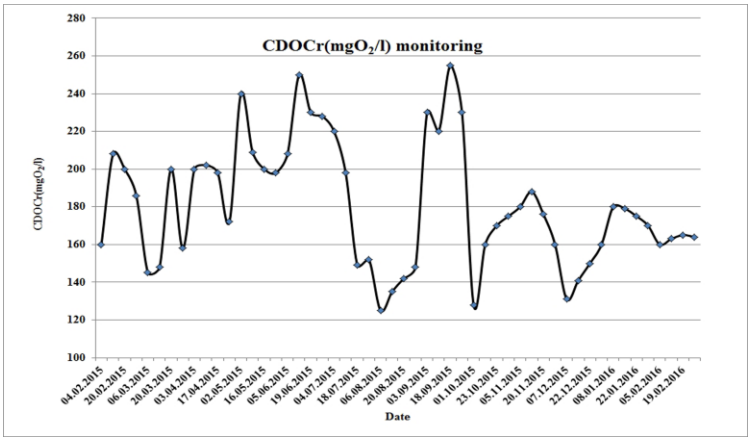

Figure 1
CODCr monitoring of wastewaters under study.

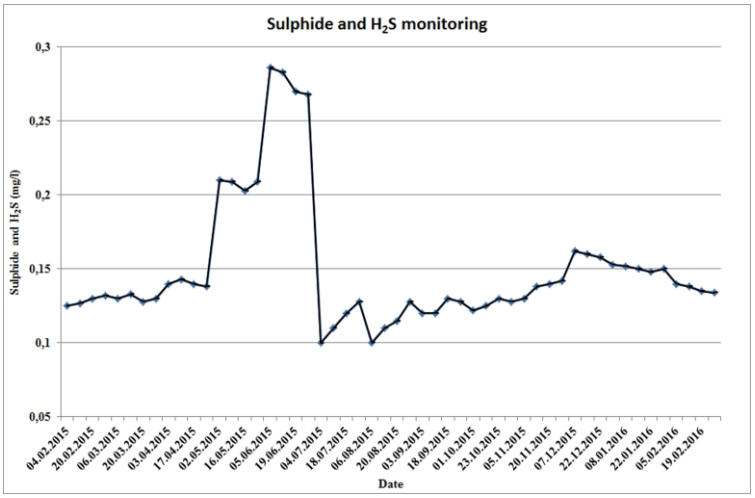

Figure 2
Sulphide and hydrogen sulfide monitoring during 2015-2016.

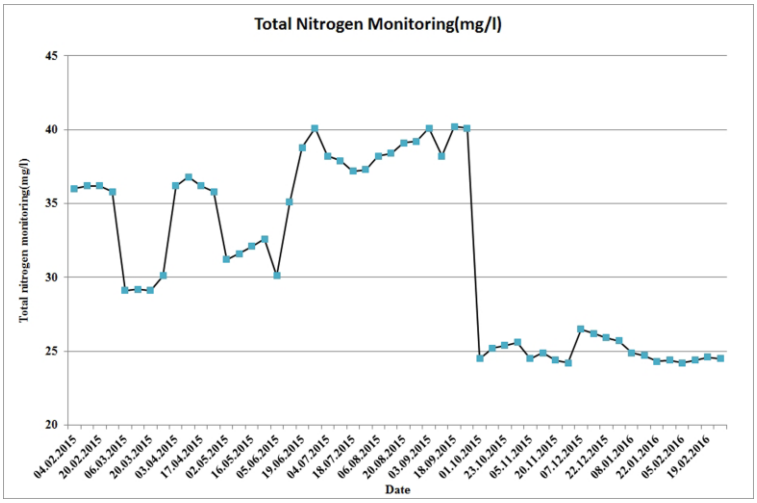

Figure 3
Total nitrogen during the monitoring period.

DOI: 10.6092/issn.2281-4485/7323

In accordance with the EU Directive for urban wastewater (91/271/EEC), total nitrogen (NT) of the exhaust flow of a water treatment plant must be at least 70-80% below the concentration of the input flow plant. That means NT must not exceed the limit value of 15 mg/l or 10 mg/l. For the studied wastewaters it is possible to reduce this indicator below the permissible value of 15 mg/l.
In February and May, for ammonia were registered values higher than 35 mg /l (Figure 4). Even the treatment plant would reduce the amount of ammonia at 90%, the amount of ammonia in the effluent would be approximately 3.56 mg/l, above the permissible value (0.5mg/l). Great level of ammonia can contribute to the eutrophication of surface waters (Pigue, 2013).

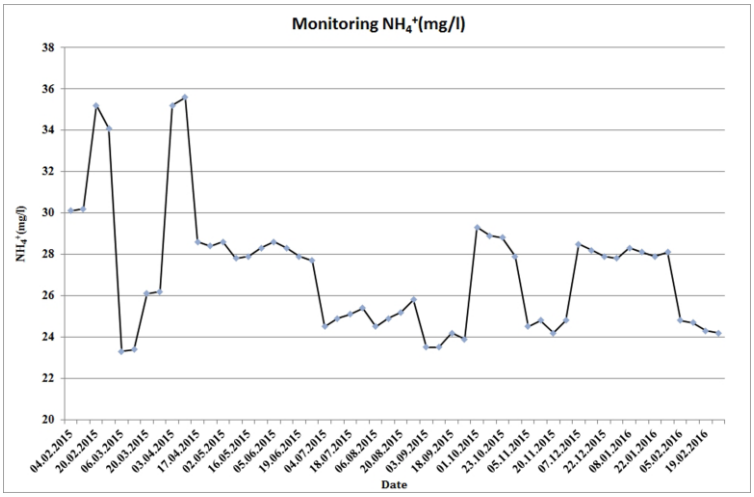

Figure 4
The ammonia content in waste water during February 2015 - February 2016

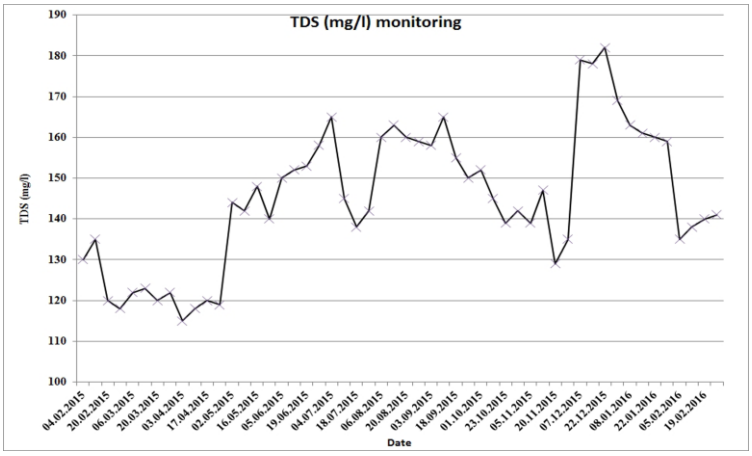

Figure 5
Total dispersed solids (TDS) in analyzed samples during the monitoring period.

TDS is a measure of the amount of dissolved matter in water. Constituents of TDS can include carbonate, bicarbonate, chloride, nitrate, sulfate, phosphate, organic ions, calcium, magnesium, sodium etc. (Murphy, 2007).
In July, August, September and December 2015, the amount of total suspended solids (TDS) was over 160 mg/l (Figure 5).

Large amounts of phosphorus (4-4.5 mg/l) were found in wastewater during winter (Figure 6). On hot days, the amount of phosphorus reached values less than 2.5 mg / l. In the treatment plant, phosphorous can be reduced in proportion of 80%. The amount of phosphorus in the effluent could have values below 2 mg/l, the allowed value according to Romanian law: HG nr.188/2002.

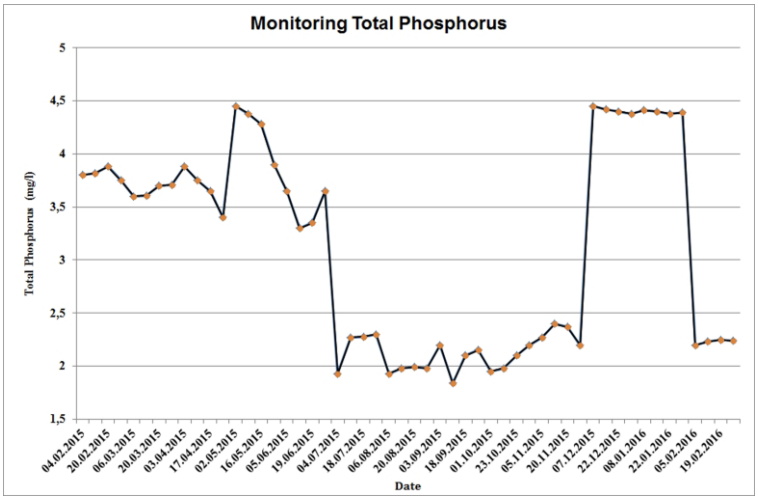

Figure 6
Total phosphorus in waste water during February 2015 - February 2016

Total suspended solids (TSS) are solids in water that can not pass through a filter (American Public Health Association, 1998). High level of TSS in wastewater affects the stream health and aquatic life.
In July, August, September and December 2015, the amount of suspended solids (TSS) was over 160 mg/l (Figure7).

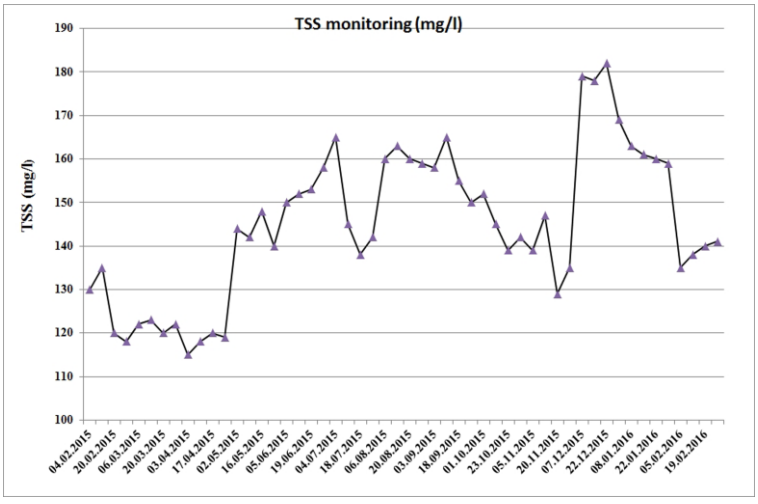

Figure 7
The amount of suspended solids (TSS) during monitoring period

After the treatment TSS could not be reduced below the permissible value of 35 mg/l. These kinds of solids these solids come from sewage and industry.

DOI: 10.6092/issn.2281-4485/7323

pH values of wastewater were placed in a normal range of values during the entire studied (Fig. 8).

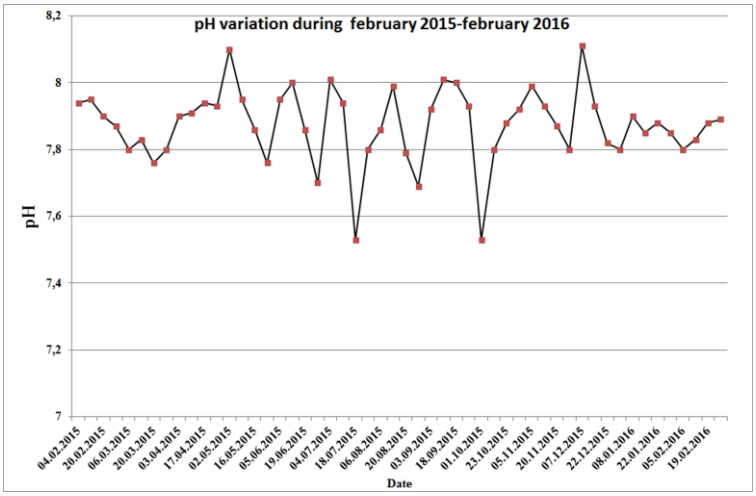

Figure 8
pH variation during monitoring period

Conclusions

During February 2015 to February 2016 we studied the indicators of wastewaters which enter in the treatment station of Galati. Some of the indicators had acceptable levels but some of them have values above the permissible values imposed by Romanian Government Decision no. 188/2002 and Council Directive 91/271/EEC. It requires treatments that contain more rigorous physical, chemical and biological processes.

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DOI: 10.6092/issn.2281-4485/7323

EVALUATION DES EAUX USÉES DANS LA VILLE DE GALATZ (ROUMANIE) PENDANT 2015-2016

Résumé

En raison de l'industrialisation et de l'urbanisation, une grande quantite d'eaux usees est produite chaque jour. Il est important de surveiller la qualite des eaux usées et de déterminer s'il est sûr de les rejeter dans l'environnement.
Dans cette étude, la qualité des eaux usées de la ville de Galatz, Roumanie, a été évaluée. Les eaux usées proviennent généralement des activités domestiques et de l'industrie. Nous avons été suivis des eaux usées entrant dans la station de traitement de la ville.
Afin de surveiller la qualité des eaux usées, certains paramètres physiques et chimiques ont été déterminés selon des méthodes standard. Les paramètres chimiques analysés étaient les suivants: ammonium (mg/l), azote total (mg/l), sulfures et sulfure d'hydrogène (mg/l), phosphore total (mg/l), solides totaux dispersés, solides totaux en suspension (mg/l), demande chimique en oxygène et le pH. Comme paramètres physiques a été étudié seulement la conductivité. Ces données ont été collectées entre février 2015 et février 2016. Les paramètres physico-chimiques ont été déterminés chaque mois durant cette période.

Mots clés: *surveillance, eaux usees, parametres physiques, parametres chimiques, valeurs admissibles pour les indicateurs de qualite*

VALUTAZIONE DELLA QUALITÀ DELLE ACQUE REFLUE NELLA CITTÀ DI GALATZ (ROMANIA) NEL PERIODO 2015-2016

Riassunto

In questo studio, la qualità delle acque di scarico nella città di Galatz, dalla Romania, è stata valutata. Le acque reflue derivano generalmente dalle attività domestiche e dall'industria. Siamo stati monitorati gli scarichi che entravano nella stazione di trattamento della città.
Per monitorare la qualità delle acque di scarico, alcuni parametri fisici e chimici sono stati determinati secondo metodi standard. I parametri chimici analizzati sono stati: ammonio, azoto totale, solfuri e solfuro di idrogeno, fosforo totale, solidi totali dispersi, solidi totali in sospensione, richiesta di ossigeno chimico e pH. Come parametri fisici sono stati studiati solo conduttività. Questi dati sono stati raccolti nel febbraio 2015-febbraio 2016. I parametri fisico-chimici sono stati determinati ogni mese durante questo periodo.

Parole chiave: *monitoraggio, delle acque reflue, parametri fisici, parametri chimici, valori ammissibili per indicatori di qualità*