THE EFFICIENCY OF TREATING SEWAGE WATERS AT TIMISOARA WASTEWATER TREATMENT PLANT

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Abstract*. Discharging of some affluent insufficiently treated has led to the alteration of streams and to the apparition of a wide range of contaminants: organic substances, hardly degradable, nitrogen, phosphor and sulfurs compounds, microelements (copper, zinc, lead), pesticides, organic- chlorinated insecticides, detergents, etc. A feature of the river's water is the self-cleaning capacity, due to a series of natural biochemical processes, favored by the contact air-water. The self-cleaning process is made by the action of some environment agents, of a physical, chemical and biological nature, which may simultaneously interfere or in a succession order. But when water pollutants overpass the self-cleaning process, wastewater treatment plants are required. In the present paper work it is presented the Timisoara wastewater treatment plant and it is made an analysis of self-cleaning capacity of the waste water treatment plant in 2016 and 2017. One may notice that, after the performed analysis, there is an increased efficiency of the Timisoara city waste water treatment plant by the fact that at the entrance of the waste water treatment plant, values are much above the maximum allowed value, and after the self-cleaning process, values have been much beyond under the limits allowed by the law.*

Keywords: *waste water, efficiency treatment plant, water pollutants, environment*

INTRODUCTION

Can be used for water supply of the populated centers and industries the following natural sources, which are distinguished between them by qualitative characteristics, flow regime and the possibilities for capture and treatment (HAMEED, 2010): the sources of surface water, consisting from flowing waters: rivers, tributaries and rivers, natural and artificial lakes and groundwater sources. With the use of these water sources for domestic, public, industrial and other uses, water is loaded with a wide range of physical, chemical and bacteriological pollutants (CRISTA, 2013, RADULOV, 2016). After discharge into an emissary, these waste waters can lead to pollution of the river. An important role has the self-purification or natural purification capacity of the river, which is represented by all natural processes of purification by which water is brought back to the existing quality level before it is polluted and has, on a natural scale, the role of a purification plant of contaminated waters, downstream of the spill point. The process of self-purification is accomplished by the action of some environmental, physical, chemical and biological factors that can intervene simultaneously or in a certain succession. However, at urban level, this self-purification process is outweighed by the emissary self- purifying capacity.

Under these conditions are required sewage treatment processes. Waste water treatment is the set of physical, chemical, biological and bacteriological processes, through which is reduced the load in organic or inorganic pollutants and in bacteria, for the purpose of protecting the environment and human health. It has as result obtaining some clean waters, in varying degrees of purification, depending on the technologies and equipment used, as well as a mixture of bodies and substances that are, commonly, named sludge (FOSTER, 2002, MARTONOS, 2017).

MATHERIAL AND METODS

The exhaustion station under study is Timisoara Station, which before 2000 did not operate at normal parameters, having problems of cross-border pollution of the water flowing on the territory of Serbia.

The refurbished treatment plant operates at the following parameters: 440,000 equivalent inhabitants, average daily flow = 2,400 l/s and maximum daily flow = 3,000 l/s.

The water taken from the city's sewage system, through the four main collectors, enters into the sewage treatment plant and goes, before spilling into the Bega River, through a mechanical step and an advanced biological treatment step.

The mechanical step consists of four rare and frequent grills, equipped with washing, compacting devices and waste storage. The domestic water pumping station provides water transport to four desulphurization lines, coupled with grease separators. The sands are washed and stored in special containers, and the fats are stored in a concentrator.

The biological step includes the nitrification-denitrification process and the chemical treatment of the phosphorus. The biological basin has a volume of 106,600 cubic meters, divided into four lines. Each line ensures the achievement of denitrification and nitrification, being provided with external and internal recirculation. The removal of the phosphorus is done chemically, by using ferrous sulphate as a clotting agent, through the help of a facility for dosing and injection. The injection is possible at three different points of the technological flow. The separation of biomass is done in eight circular secondary decanters with diameters of 40 and 48 m. The effluent is discharged through a channel, directly into the Bega River.

The biologic sludge is stored in pools, thickened and dehydrated with polyelectrolyte. The station is provided with a polyelectrolyte dosing plant. The sludge is thickened and dehydrated using three Bellmer band filters, up to about 20-22% SU.

The modernization of the treatment plant from Timisoara has as effect the reducing of the environment pollution (water, air, soil) and achieving an increased protection of the health of the neighboring population and of the operating personnel. So, an important step, towards alignment with the European Union norms, in the field of environmental protection, was made, but also a new step of assimilation into the classical scheme of the of the treatment plants from Romania of some efficient purification technologies of high efficiency, low impact on the environmental factors and elimination of eutrophication compounds.

Were determined the suspended matter, biochemical oxygen consumption in 5 days, the nitrite content, nitrates, phosphates, ammonia and phosphorus content. The results of the performed analyzes were compared with NORMATIV NTPA-001/2002 regarding the determination of the limits of pollutants loading of the industrial and urban waste waters to the discharge into the natural receptors.

RESULTS AND DISSCUTIONS

Were analyzed the monthly values taken in **2016**, both at the entrance to the treatment plant and at the exit. They are observed the high input values and the efficiency of the purification station, mirrored in the small values, from the drainage channel of treated waters in the Bega channel.

It is noted that at the entrance into the treatment plant, the suspended matter (figure 1) was between 117.05 mg/l in February and reached a maximum of 156.00 mg/l in May, exceeding the maximum admissible limit of 35 mg/l according to NTPA-0.01-2002. After the purification process, the amount of suspended matter drops between 7.11 mg/l in August and reaches a peak of 12.3 mg/l in May, well below the maximum limit allowed.

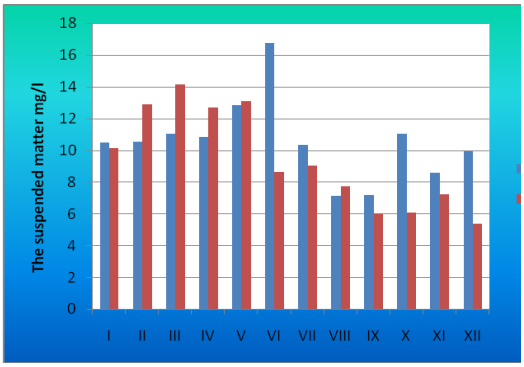

Figure 1. The suspended matter

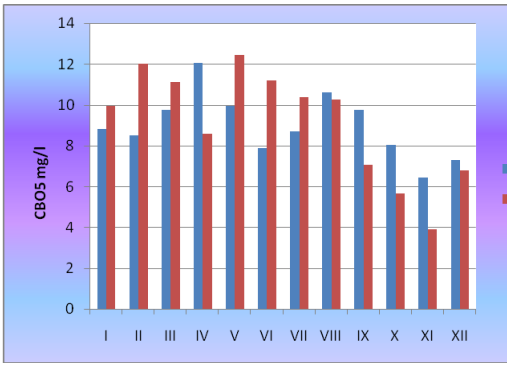

Figure 2. The biochemical oxygen consumption within 5 days

The biochemical oxygen consumption within 5 days, at the entrance into the treatment plant was between 120.45 mg/l in February and reached a maximum of 159.76 mg/l in August, which greatly exceeds the maximum admissible limit that is of 30 mg/l. Following the purification process, biochemical oxygen consumption decreases in 5 days with values ranging between 6.45 mg/l in November and a maximum of 12.05 mg/l in April, the values obtained are well below the maximum limit allowed (figure 2).

Regarding the nutrient regime, the nitrate content (figure 3) from water fits the water at the entrance into the treatment plant with value between 240.95 mg/l in February and reaches a maximum of 297.29 mg/l in June, exceeding very much the maximum admissible limit of 50 mg/l. Passing through the purification process, the content of the nitrates from water drops between values of 14,80 mg/l in November and reaches a maximum of 41,25 mg/l in April, which is below the maximum allowed value.

It is noted that at the entrance, total phosphorus was between 2.33 mg/l in January and reached a maximum of 3.21 mg/l in May, exceeding the maximum limit of 5 mg/l. After purification, the total phosphorus content drops between 0.69 mg/l in January and reaches a maximum of 1.00 mg/l in November, which is below the maximum allowed value.

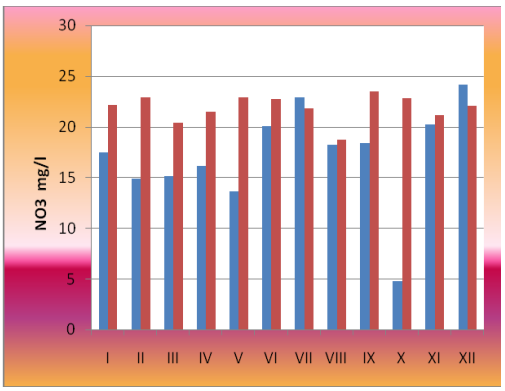

Figure 3. The nitrate content

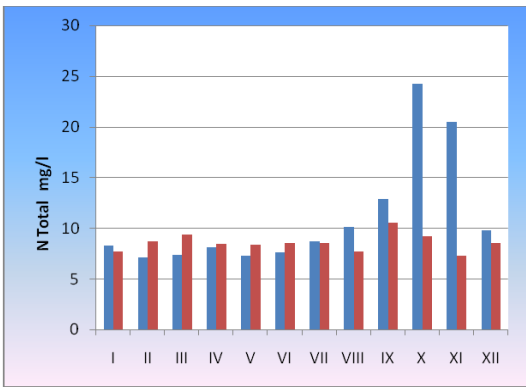

Figure 4. The amount of total N

At the exit from the treatment plant, the amount of nitrate is between 4.73 mg/l in October and reaches a peak of 24.11 in December, well below the maximum admissible limit of 37 mg/l.

Also, at the exit from the treatment plant, the amount of ammoniac nitrogen is between 0.21 mg/l in April and 0.66 mg/l in June, well below the maximum admissible value of 3 mg/l, except for month September, October, November and December with values ranging from 7.27 mg/l in December to a maximum of 28.65 mg/l in October, values exceeding the maximum allowed limit.

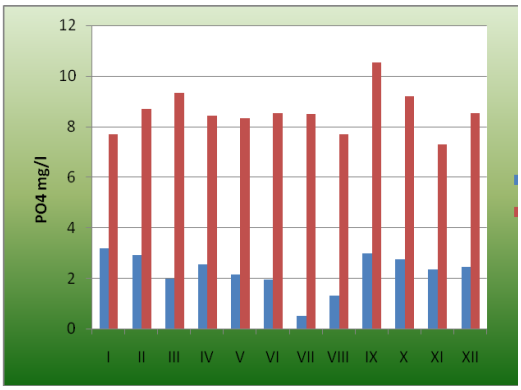

Figure 5. The content of PO_4

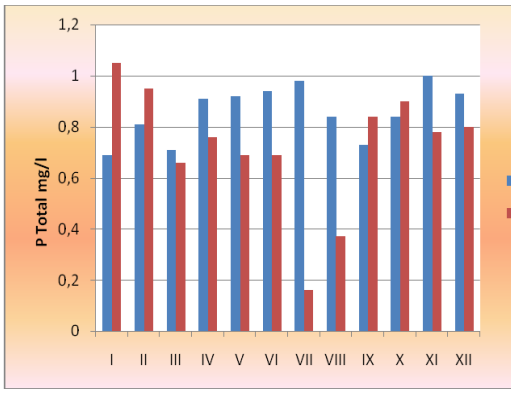

Figure 6. The content of P total

It is noticed that the amount of total N (figure 4) at the exit from the treatment plant is 28.65 mg/l in October compared to 38.82 mg/l as it was at the entrance, being less efficient reduction of total N from the waste water.

They were analyzed the monthly values taken in **2017**, both at the entrance to the treatment plant and at the exit. The high input values and the efficiency of the purification station are observed mirrored in the small values from the drainage channel of the waste water in the Bega channel.

At the entrance into the treatment plant, it is observed that the suspended matter was between 118.05 mg/l in January and reached a maximum of 156.71 mg/l in February, which exceeds the maximum admissible limit of 35 mg/l according to NTPA-0.01-2002. After treatment, the amount of suspended matter drops between 5.37 mg/l in December and reaches a maximum of 14.13 in March, far below the maximum allowed limit.

Biochemical oxygen consumption in 5 days, at entrance into the treatment plant was between 130.00 mg/l in February and reached a maximum of 177.56 mg/l in May, well above the maximum allowed limit of 30 mg/l. Following the purification process, biochemical oxygen demand decreases in 5 days, with values ranging between 3.93 mg/l in November and a maximum of 12.44 mg/l in May, the values obtained are well below the maximum allowed limit.

Regarding the nutrient regime, the nitrate content in the water falls into the sewage treatment plant with values between 236.68 mg/l in December and reaches a peak of 295.45 mg/l in June, exceeding very much the maximum admissible limit of 50 mg/l. Passing through the purification process, the water content of nitrates drops between 16.38 mg/l in October and reaches a maximum of 30.67 mg/l in May, which is below the maximum allowed value.

The total phosphorus input at the entrance into the treatment plant was between 1.54 mg/l in August and reached a maximum of 3.20 mg/l in April, which exceed the maximum

admissible limit of 5 mg/l. After treatment, total phosphorus decreases between 0.16 mg/l in July and reaches a maximum of 1.05 mg/l in January, which is below the maximum allowed value. At the exit from the treatment plant, the amount of nitrates is between 18.75 mg/l in August and reaches a maximum of 23.46 in September, well below the maximum admissible limit of 37 mg/l.

Also, at the exit from the treatment plant, the amount of ammoniac nitrogen is between 0.11 mg/l in October and 0.99 mg/l in April, being well below the maximum admissible value of 3 mg/l.

It is noted that the total amount of N at the exit from the treatment plant is 7.68 mg/l in January compared to 30.4 mg/l as it was at the entrance, being an efficiency of 4 times of reduction of total N from the waste water.

CONCLUSIONS

1. In order to highlight the efficiency of wastewater treatment, were analyzed the monthly values taken in 2016 and 2017, both at the entrance into the treatment plant and at the exit.
2. Are highlighted the advanced purification processes, by the use of modern technological processes.
3. Analyzing the amount of suspended matter, it is observed that at the entrance into the treatment plant the highest value is 156.00 mg/l in May for 2016, following the purification process, the highest quantity is 16.76 mg/l in June, for the year 2017 we have a maximum of 156.71 mg/l in February, and drops after the purification process to a low value of 14.13 mg/l in March.
4. The biochemical oxygen consumption in 5 days was 159.76 mg/l in August for 2016 and reached to 12.05 mg/l in April. In 2017, biochemical oxygen consumption in 5 days reached at a maximum of 177.56 mg/l in May, reaching at value of 12.44 mg/l also in May.
5. The nitrate content was 297.29 mg/l in 2016 and respectively 295.45 mg/l for the year 2017, being passed through the purification process the values reaching to 41.25 mg/l and 30.67 mg/l.
6. The total phosphorus for 2016 reached a maximum of 5 mg/l and 3,20 mg/l for 2017, the values obtained after the purification process are 1,00 mg/l and 1,05 mg/l.
7. The nitrogen content for 2016 reaches a maximum of 24.11 mg/l and 23.46 mg/l for 2017.
8. Ammoniac nitrogen reaches a maximum of 28.65 mg/l for 2016 and 23.46 mg/l respectively for 2017.
9. As for the total nitrogen quantity at the entrance into the treatment plant, it was 38.82 mg/l for 2016 and reached 24.24 mg/l. For 2017 at the entrance into the treatment plant it was 32.27 mg/l and reached a value of 7.68 mg/l.
10. As a final conclusion, we can see the increased efficiency of the Timisoara wastewater treatment plant by the fact that at the entrance into the treatment plant the values are well above the maximum admissible value and after the purification process the values were well below the limits accepted by law.

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